FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 85 Thursday, July 22, 1948 No. 1664

49, Wellington Street, London, W.C.2
'Grams: "Zacatecas, Rand, London"
'Phone: Temple Bar 3951 (Private Branch Exchange)
PUBLISHED WEEKLY: 26s. per annum (Home and Overseas)

Works Photography

The taking of pictures inside foundry shops is in no way related to the production of snapshots of one's friends on a Sunday afternoon in the garden. The former must be of such a character as to serve a purpose infinitely more important than the souvenir of a happy gathering. Many interior views of foundry or plant are designed to indicate to the public, including customers, the type of facilities available for the production of articles to be sold, and the conditions under which they are made. Others are purely of a technical character, which either provide records for internal use or help for a lecturer to dispense with much descriptive matter.

Of the first type, there should be a recognition that the photographic artist can do much to bring into relief the features it is desirable to stress and to fade out imperfections. It is quite often difficult so to arrange the shop that a perfect picture can be taken. Coats and other garments may have been left hanging from the walls, or an apprentice may look extremely untidy owing to his having too long deferred a visit to the barber. Such defects can, and should, be remedied in the studio before release to the block maker or printer. Again, a good effect can often be obtained by toning down the shop so as to bring into relief the main subject of the picture.

It is always a moot question as to whether operatives should be included in pictures of industrial shops. We, personally, prefer their presence, otherwise, the buildings tend to resemble Old Trafford on a wet Sunday afternoon. Their inclusion, however, should be selective. One of the most modern works in the country has a corps of smart-looking operatives, who are appropriated by the works photographer to man the machines of any section to be recorded. This may savour of over-smartness in publicity, yet usually some action of this type is necessary, as it is not uncommon for the untidiest amongst the staff to over-emphasise his presence on such occasions. Moreover, many modern apprentices look almost effeminate with their craze for long hair.

For technical pictures, there should be no "faking" of the types to which we have drawn attention, but again the elimination of extraneous features can often usefully be carried out. The essential points, such as the tools, should be displayed in an orderly fashion and worn ones and improvisations should be ruthlessly cut out or changed for new ones. For example, if a ladder be shown leading down to the interior of a large mould, then it should be reasonably new, and not in the last stage of dilapidation. The best trucks and barrows which the foundry possesses should be included in each picture, whether technical or commercial in its appeal. When the publicity department decide to use such material as photomicrographs in their brochures, then the technical department should insist that they be printed on white paper and that the magnification and the etching media be stated. Otherwise, the technical recipient merely gets the impression that it is an attempt to blind him with science. The letterpress of commercial publications should also be vetted by the technical staff. Especially is this important when cinema films are being prepared. Only recently we saw a film marred through the use of wrong technical words.

Thus we counsel that more thought should be given to industrial photography, but in saying this we are both cognisant and appreciative of the great strides which have been made in recent years and which a survey of earlier issues of the JOURNAL well reveals.

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Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

RESEARCH FINANCE

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—The editorial article of your issue of July 1 states that "research associations accepting Government grants-in-aid are, to our mind, being asked to submit to conditions of control which are intolerable."

As responsible officers of the Associations concerned with metal casting, we wish flatly to contradict this statement, which, indeed, contradicts itself. Our relations with the Department of Scientific and Industrial Research are of the most harmonious character and the Department itself is invariably most helpful. Our associations are self-governing bodies, the government of which rests with our respective councils, responsible directly to our members. To suggest that Government grant entails such conditions is a misrepresentation of facts and is completely contrary to our experience.—Yours, etc.,

G. L. BAILEY,
Director, British Non-Ferrous Metals Research Association,

CHARLES GOODEVE,
Director, British Iron and Steel Research Association,

J. G. PEARCE,
Director, British Cast Iron Research Association.

LIGHT ALLOY TEST BARS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—The casting of separately cast test-bars in foundries has given rise to much discussion, and the problem of obtaining reproducible conditions has received particular attention. In our laboratories we have tried to obtain, as far as possible, standardised conditions for the casting of aluminium alloy test-bars. For this purpose, we have constructed a test-bar casting bench, which has been used successfully over a considerable period in our laboratories and foundries.

The casting bench, a photograph of which is shown, has been designed to accommodate A.I.D. pattern sand-cast test-bar moulds. It is simple to construct, and can incorporate any convenient number of units.

The angle of tilt of the mould at the start of casting is 45 deg., and when the test-bar shank is filled, the mould is brought slowly up to the vertical position, the feeder head being filled during this period. The handle attached to the back of the unit makes it very simple to control the movement of the mould. The bench can be used for pouring from a small crucible or hand ladle.

In order to obtain better control of the rate of pour, a hand ladle with a narrow spout may be used, such that a stream of metal about ¼ in. wide can be obtained. When casting test-bars, the rate of pour is controlled so that the test-bar shank is filled in about 15 secs., and then the feeder head filled quickly so as to retain heat for feeding.—Yours, etc.,

S. J. WILLIAMS,
Laboratories of the International Alloys, Limited.

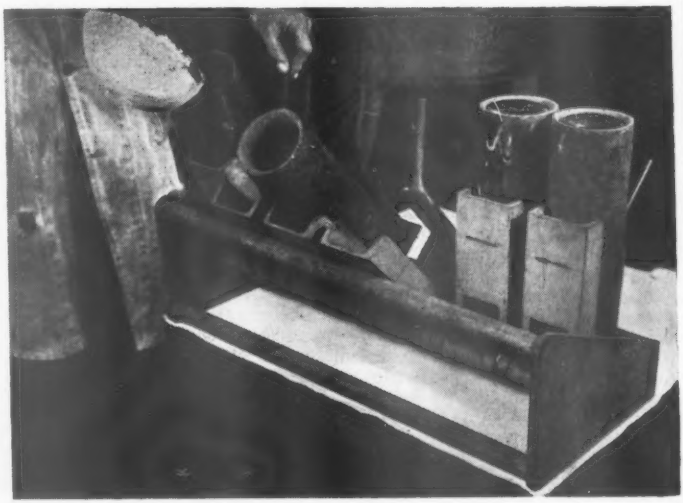
Aylesbury, Bucks.
July 9, 1948.

Australian Visitors

Mr. E. Castley is a member of the firm E. J. Castley Importers, Limited, Launceston, Tasmania, and is visiting the United Kingdom to buy and arrange agencies for electrical household appliances and electric fractional motors. London address: C/o the Bank of Australasia, 4, Threadneedle Street, London, E.C.

Mr. A. E. Hocking, chairman of directors of William Bedford, Limited, Flinders Lane, Melbourne, engineers, motorworks and brass finishers, is to discuss the question of manufacturing under licence with a number of U.K. industrialists. Bedfords have a most modern indusrtial plant. London address: C/o Bank of Adelaide, 11, Leadenhall Street, London.

MR. J. H. MYRTLE, managing director, Morgan Crucible Company, Limited, Sydney, is arriving in this country early in September. He will be located at the Battersea works.



ARRANGEMENT FOR CASTING LIGHT ALLOY TEST-BARS.

The Casting of Marine Bronze Propellers

Randupson Process applied in a Specialised Non-ferrous Foundry

By F. J. Tector, B.Eng., and J. Martland

INTRODUCTION

The casting of bronze marine propellers in high-tensile bronzes or, more correctly, high-tensile brasses, is a process which has become the speciality of a few firms who, over many years, have developed from foundries interested mainly in the supply of castings, to engineering concerns who design, cast, machine, finish and take full responsibility for the performance and life of the finished component.

*A Paper read before the Lancashire Branch of the Institute of British Foundrymen, Mr. R. R. Hargreaves presiding. The authors are on the staff of the Manganese Bronze & Brass Company, Limited.

It is still a popular belief that propellers are merely castings made as closely to size as foundry technique permits, the castings being subsequently bored, trimmed and polished. Whereas this is still the case as far as iron propellers are concerned (although in this instance the blades are not polished), the modern high efficiency bronze propeller is now required to be manufactured to such close tolerances of pitch, thickness, etc., that cast surfaces are not suitable, and they are now machined on the pressure faces and chipped to accurate contours on the suction faces. Fig. 1 shows a propeller designed about 20 years ago which may be compared with its modern counterpart in Fig. 2. In the latter the tolerances and number of thickness checking points

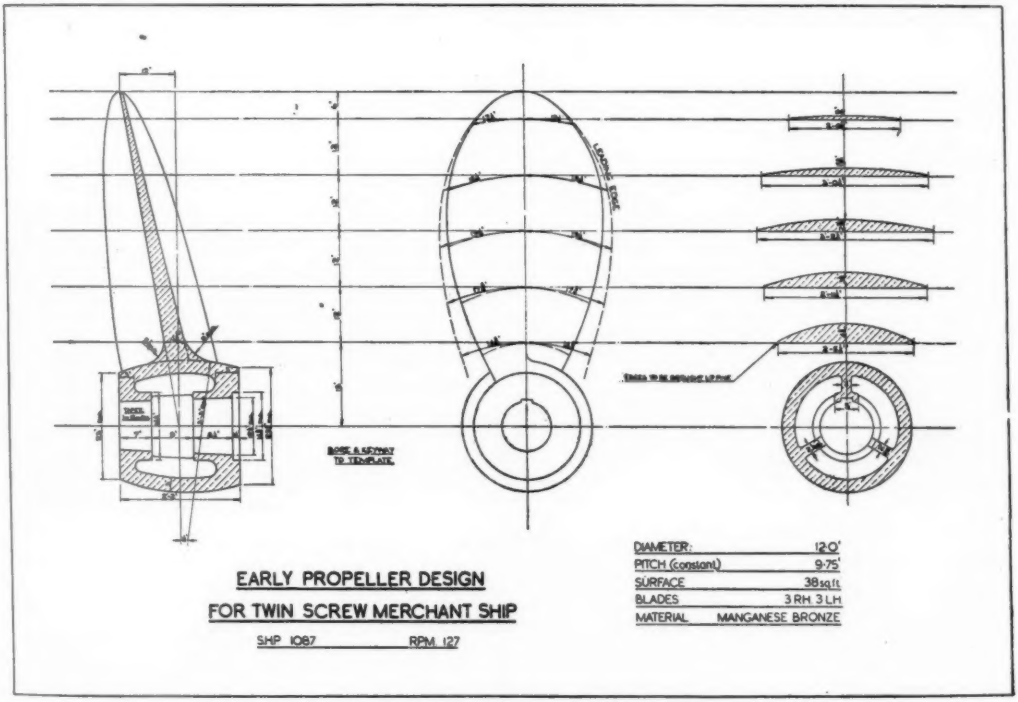


FIG. 1.—EARLY DESIGN OF PROPELLER.

The Casting of Marine Bronze Propellers

should be noted. Also the pitch of the blade which has a hyperbolic type of variation from tip to root.

It is, of course, still claimed by some people that it is possible to cast sufficiently close to size as to make machining unnecessary. Most experienced foundrymen taking a practical view will, however, readily agree that to produce, say, a four-bladed propeller of 25 tons weight and 20-ft. dia. to tolerances which call for a pitch-face accuracy on a 12-in. span of ± 1 per cent. (which roughly means that the surface must be accurate to 1/20 in. on the outer part) and thickness tolerances of ± 0.04 in. is a virtual impossibility. Incidentally, the above tolerances are everyday practice in the firm with which the Authors are associated.

Propeller castings fall into a very special class for many other reasons, among these being:—(1) They are highly stressed (designed working stresses commonly ranging between 6,000 to 12,000 lb. per sq. in., depending on type); (2) they are invariably subject to machining and finishing operations on the whole of the surfaces, and a high standard of surface finish is necessary; (3) they are subject to heavy erosive, corrosive and galvanic action in service which inevitably reveal latent defects, and (4) they are very large, even by modern standards. They range commonly from 6 to 18 tons finished, and, in many cases, over 30 tons.

From the production point of view, propellers also present a difficulty, not commonly encountered, inasmuch as no standardisation is possible. Although to some extent shipowners and shipbuilders like to standardise their fleets into various classes of ships, it does not follow that any appreciable number of identical propellers are ordered at one time. In practice six-off one design would be unusual. Consequently, the standardisation of pattern and moulding equipment is virtually impossible.

A finished propeller is shown in Fig. 3, the leading dimensions being as follow:—Diameter, 19 ft. 3 in.; pitch, 19.62 ft.; surface, 175 sq. ft., and finished weight, 25 tons.

A pair of these propellers were fitted to a well-known passenger liner in 1938. This vessel has had an exceptional war record as a fast troop-carrying liner and has steamed many thousands of miles at high speed. It is noteworthy that on reconversion to peacetime duties only repolishing was necessary to restore the propellers to first-class condition.

Randupson Moulding Process

The basic moulding process used by the Manganese Bronze & Brass Company is the Randupson sand-cement

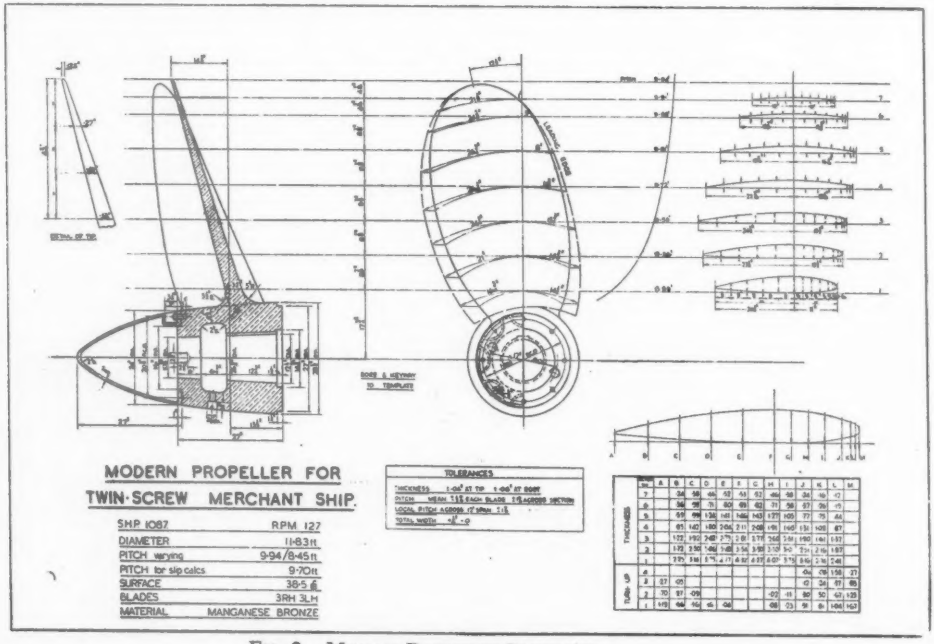


FIG. 2.—MODERN DESIGN OF PROPELLER.

process introduced in 1938. Although this was the subject of an excellent Paper* by F. W. Rowe before this Institute in 1938, it is probably still unfamiliar to most foundrymen and, consequently, a brief outline is given of its main features.

A pure silica sand of average grading between 20 and 50 mesh is used as a basic material to which is added ordinary Portland cement and water to produce, on setting, a sub-hydrated sand-cement mixture having a compression strength of approximately 220 lb. per sq. in., after 48 to 72 hours' drying time at normal shop temperatures. This material, when suitably reinforced internally with steel bars, is sufficiently strong to withstand the stresses imposed by large casting operations and the mould parts lend themselves very readily to mechanical methods of assembly. It is highly refractory and also extremely permeable, and it can be hand-sleeked to a degree of smoothness quite suitable for medium and heavy castings. After use it cannot, of course, be readily broken down as can ordinary green sand or loam moulds, but it can be recovered, crushed and re-graded for further use by special plant.

The outstanding advantages of the sand-cement process over the earlier loam methods for heavy propeller work are, however, primarily that it eliminates the necessity for stove drying, which, in the past, called for very large drying stoves and very heavy handling equipment, and that it enables the majority of the work to be done at floor level on a concrete floor without the dirt and dust commonly associated with heavy foundry work, as is shown in Fig. 4. Furthermore, as the moulds are extremely rigid, castings made in sand cement are truer to dimensions than the conventional loam moulds.

As new sand is more refractory than reconditioned sand, the former is used for facing purposes where the mould parts are in contact with the hot metal. The body of the mould is made from reconditioned sand and the centres of the mould beds and tops are filled in with lumps of old broken moulds, not only to economise material, but also to provide venting space.

Propeller Moulding

Owing to the widely varying characteristics of individual propellers, the use of full patterns either of metal or wood is normally impossible. They are used, of course, when "numbers off" warrant, but this condition is exceptional. If patterns be used, they are usually of metal which can later be finished to actual propellers. In America, single-blade wooden patterns are commonly used, but this method is seldom used in this country except for very small propellers.

This Paper will, therefore, be confined to the strickling process, of which the first stage is to strike up the mould bed to the "face pitch required." As the expression "face pitch" may be a little obscure, a short explanation of what is meant will be given. The face of a blade of a propeller lying with its axis vertical may be regarded as a portion of a helical surface which, if extended for a full 360 deg., would rise a certain vertical distance. This vertical distance is termed the pitch and is a measure of the steepness of the angle of the blade. At all radial distances the lift is equal, but as the circumference increases proportionately to the radius, the pitch angle will decrease progressively as the

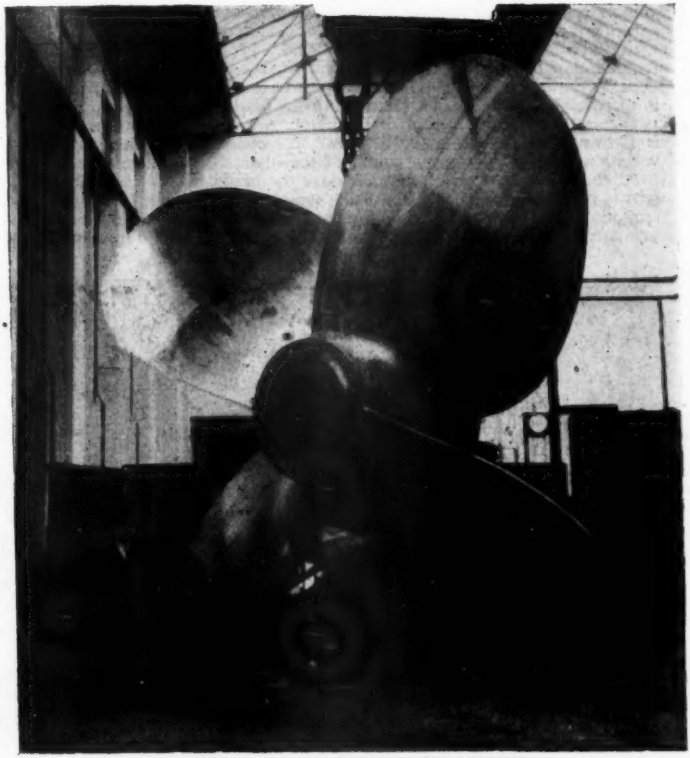


FIG. 3.—A FINISHED BRONZE PROPELLER.

*F.T.J., Vol. 58, page 520 *et seq.*

The Casting of Marine Bronze Propellers

diameter increases. It is necessary, therefore, to make the pitch rail (whatever its diameter) to give the vertical lift proportional to the portion of the circumference.

The pitch striking board is pivoted at the centre on a steel spindle of suitable diameter and length and, at its outer end, rests on the pitch rail. The weight of the striking board is balanced by a counterweight, and the connecting chain passes over a pulley mounted on top of the spindle in a rotatable housing. By sweeping the pitch striking board up the pitch rail a true helical surface can be generated. The necessary size of bed having been determined, shuttering is arranged to form a suitable box and the bed is progressively filled with sand cement and swept up in successive stages until a correct bed is obtained. Suitable reinforcing ironwork is included and the necessary provision made for venting space in the centre. This process is illustrated in Fig. 5. The bed is subsequently hand sleeked to a smooth surface, and finally a boss board is mounted on the centre spindle to sweep the outside diameter of the boss.

Modern propeller practice, however, for design reasons which are beyond the scope of this Paper, invariably features departures from the true helical surface. These departures are, most commonly, variations of pitch in a radial direction, special treatment of the blade faces, particularly towards the root of the blade to give what is known as edge turn-up or lift, and, less commonly, variations in pitch across the width of the blade.

After the preparation of a mould face the blade pattern is built on the finished bed using wooden template sections as a framework, as in Fig. 6. These sections are carefully fitted, particularly to ensure that they lie

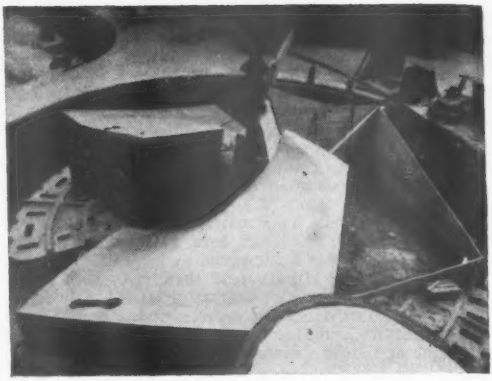


FIG. 5.—CONSTRUCTION OF MOULD BEDS.

correctly on the appropriate radii and that they are truly vertical throughout their length. In special cases metal templates are employed, and these can be rolled at the appropriate pitch angle, which method ensures the best possible accuracy. The space between the sections is filled in with sand cement and the whole blade pattern carefully faired to the correct form and the edges shaped to allow clean parting, as shown in Fig. 7.

The shuttering for the top is next set in position with the sides suitably strutted to prevent bellying when ramming and with the top edges horizontal. Reinforcing ironwork having previously been arranged over the blade pattern to strengthen the top, the box is then filled up and rammed. The completed tops are shown in Fig. 8.

After the requisite period of air drying has elapsed, the job is ready for parting. Suitable lifting eyes having been provided in the reinforcing ironwork of the tops for this purpose, the tops are lifted. The blade patterns are then removed and the beds and tops suitably dressed and blacked ready for re-assembly. Many types of mould dressing have been used over a period of years, and an American mica compound has been found most suitable. In view of the present dollar shortage, however, a carbon blacking substitute is now being used with reasonable success.

Due to the high contraction of manganese bronze, a large feeding head is required and a steel-reinforced sand-cement head ring of appropriate size is constructed separately for this purpose. The

FIG. 4.—VIEW OF THE FOUNDRY—MAIN BAY.

FIG. 6.—BLADE PATTERN SECTIONS IN PLACE.

mould is assembled by refitting the tops on the beds in their original positions, fitting the head ring and finally securing the whole together by means of the bolts and straining wires, as shown in Fig. 9. It will be noted that the mould top parts are securely held down by means of four heavy bolts engaging strong backs passing over two cast-iron rings. In heavy jobs another set of bolts is arranged to hold down the outer end of each top. It is practicable to cast propellers weighing from 16 to 18 tons above floor level, the risk of mishap being comparatively slight.

The bore of the propeller, which often incorporates one or more lifting chambers, is cored out, and the appropriate cores are constructed on perforated cast-iron barrels with alternate layers of loam and straw rope. They are reinforced by metal grids made for convenience in a brittle bronze, so that they can be broken out of the lightening chambers during fetling. These cores are dried in the normal way in a core stove.

Running and Casting

The mould is poured through a downgate running vertically through one of the tops and connected to an ingate running at a slightly upward direction into the side of the boss at its lower end. The downgate itself is supplied from a runner basin of suitable size, mounted on top of the bed, and the rate of metal flow is controlled by a plug and lever in the normal way. A dirt trap is arranged at the junction of the downgate and ingate and the entrance into the mould itself is flared out to minimise turbulence. The ingate is constructed from pre-cast sections which are made and dressed well in advance to ensure completeness of drying.

The principal requirements when casting are to maintain a reasonably quick rate of filling, together with the control of the oxide which is formed if the flow be allowed to become turbulent. As, however, the boss and inner parts of the blade are accessible from the top, skimmers can be used effectively for this purpose. Naturally, skill is acquired with long practice, and clean castings are normally obtained without difficulty. A casting operation is shown in Fig. 10. The head is usually poured with the main issue of metal to the necessary predetermined height and, after final skimming, is covered with lump charcoal to preserve its fluidity. In small propellers up to, say, 5 tons casting weight, the height of head is made so that further feeding is not required. On larger sizes, additions of hot feeding metal are made at intervals and rod feeding is carried on as long as may be necessary.

Castings are lifted after two to five days' cooling, depending on size. Bolting gear is, of course, moved earlier, and a small but important point in smooth production flow is the arrangement of casting sequences so that this gear is merely transferred from job to job. Fig. 11 shows a casting being lifted from the mould.

Manufacture of Ingots

The manganese brass commonly used for propeller manufacture is an alloy developed from a normal 60/40 brass to give physical properties of the following order: *Proof stress*, 16 to 17 tons per sq. in.; *maximum stress*, 33 to 35 tons per sq. in.; *elongation on 2 in.*, 20 to 25 per cent., and *Brinell hardness*, 130 to 140.

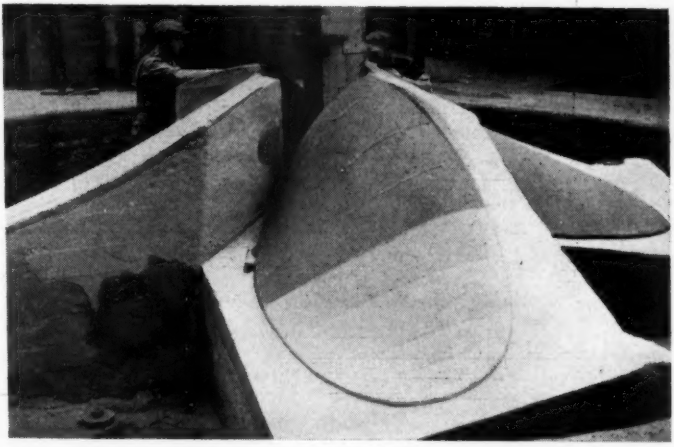


FIG. 7.—BLADE PATTERN COMPLETED.

Marine Bronze Propellers

The special strength and corrosion-resisting qualities are obtained by the addition of tin, iron, aluminium and manganese. The particular function of these elements is:—(1) Tin up to about 1.5 per cent. to increase hardness and resistance to corrosion attack; (2) iron up to about 1.5 per cent. to effect grain refinement and improve tensile qualities; (3) aluminium to increase tensile qualities (the amount added is carefully controlled in relation to the tin content and to avoid brittleness; with a tin content of 1 per cent., the maximum aluminium content is normally about 0.5 per cent.), and (4) manganese to effect grain refinement and improve tensile qualities. The normal maximum is 0.5 per cent.

The virgin metal ingots are made in 600-lb. oil or coke-fired crucible tilting furnaces. The copper and iron are first melted together, the temperature being raised sufficiently to effect good distribution of the iron. The manganese is added next in the form of 30 per cent. cupro-manganese and, finally, the major portion of the

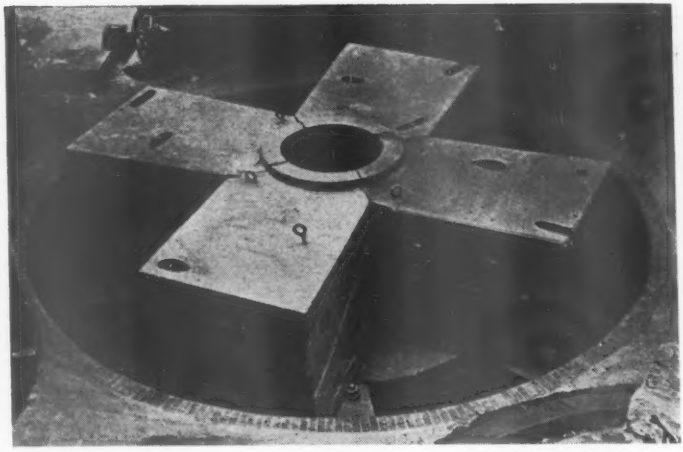


FIG. 8.—MOULD TOPS COMPLETED.

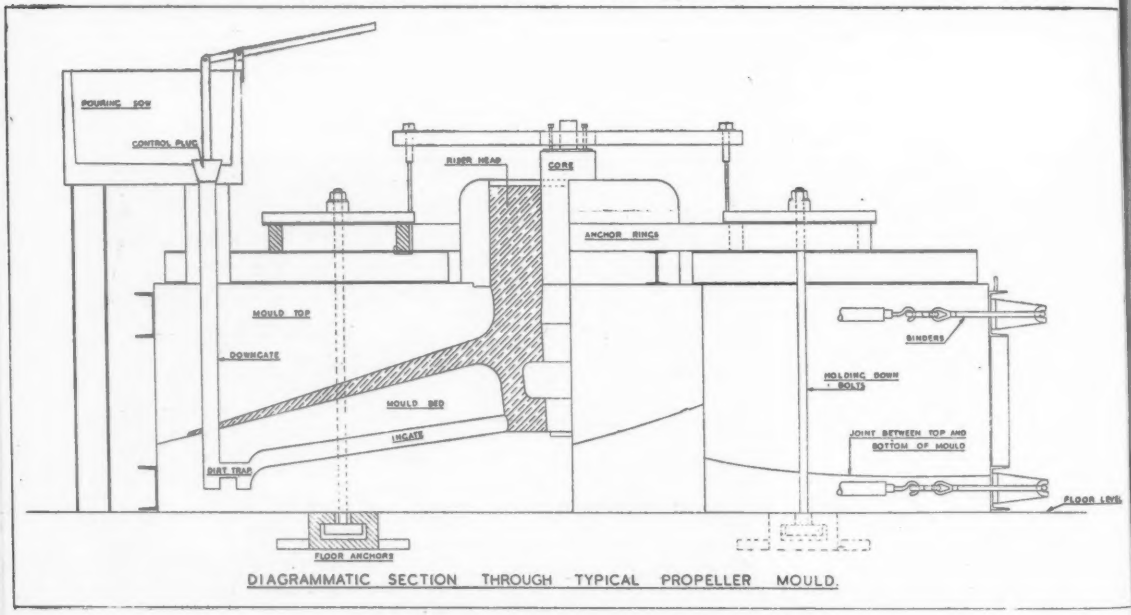


FIG. 9.—DIAGRAMMATIC SECTION THROUGH THE MOULD.

FIG. 10.—CASTING A PROPELLER.

zinc. The aluminium, tin and balance of the zinc are put in the ladle before pouring. By this method a heat can be made substantially greater than the crucible capacity. The melt is poured into 28-lb. Meehanite iron moulds, the chilling effect contributing effectively to grain refinement. Samples from each heat are tested in the laboratory to ensure that the analysis is correct before any of the ingots are passed on to the reverberatory furnaces. A view of the ingot foundry is shown in Fig. 12.

Reverberatory Furnace Practice

Charges for propeller casting metal are melted in a number of coal- and oil-fired reverberatory furnaces of various capacities ranging from 8 to 25 tons. Melting practice differs fundamentally from normal foundry procedure as, instead of a large number of small moulds being poured daily, in propeller work only a few jobs of relatively high weight are cast. This implies that furnaces have to be operated to suit the moulding programme and, generally speaking, one furnace charge is specially melted for each propeller casting. As the charge includes large riser heads, runners, pigs, etc., in addition to the main bulk of ingots, large roof openings are essential to admit these large pieces and, consequently, a form of furnace has been developed over a period of years generally on the lines shown in Fig. 13. This shows a coal-burning furnace, and it will be noted that the fixed roof and the rolling centre portion are of suspended arch construction. This type of furnace, despite the operating conditions which are admittedly unfavourable, gives reasonably satisfactory results in practice and has a fuel consumption averaging about 25 per cent. weight of fuel to weight of charge. Melting times from lighting-up from cold to tapping out range from 6 to 10 hrs. depending on weight of charge and size of furnace.

The oil-fired furnaces which have only recently been put into operation are of 10 and 15 tons capacity. The large furnace is a conversion from a coal-fired one, with a dipped roof over the hearth. This furnace has a normal fuel consumption of about 10 to 12 per cent

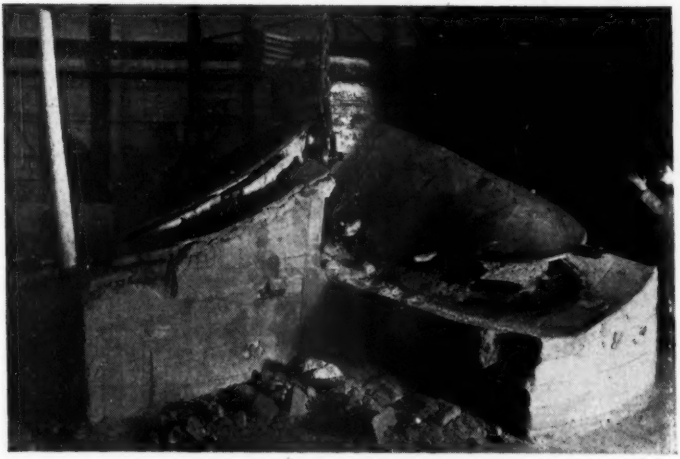


FIG. 11.—STRIPPING THE CASTING.

Marine Bronze Propellers

by weight of fuel to weight of charge melted. The smaller furnace is constructed with a flat roof, as shown in Fig. 14, and gives slightly better consumption figures.

Both of these furnaces are arranged to burn heavy fuel oil (2,000 secs. viscosity), which is stored in lagged and heated tanks and maintained at 90 deg. F. From these tanks it is circulated by pump, *via* a ring main and, before entering the burner, is preheated in an electric line heater to 200 deg. F. Oil pressure is maintained at about 25 lb. per sq. in. and low pressure burners are used with an air pressure of 20 in. w.g. A recent development to minimise the heavy electricity consumption of the electric line heaters has been the fitting of an oil-heating coil in the furnace uptake. This has proved quite successful and, after one hour's running, sufficient pre-heating is provided by the coil.

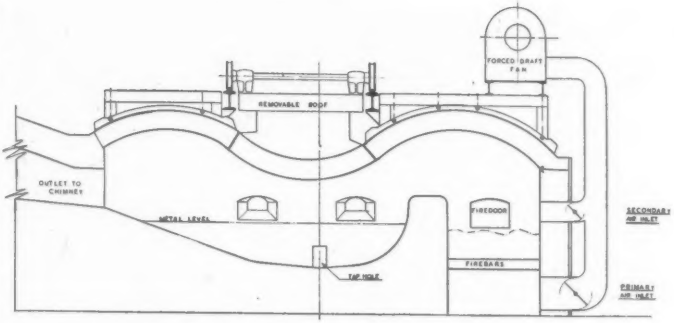


FIG. 13.—COAL-FIRED REVERBERATORY FURNACE.

Foundry Heating and Ventilation

As the successful operation, from a production point of view, of the Randupson sand-cement process depends largely on atmospheric conditions which are favourable to adequate and consistent drying of the moulds, it is essential that the foundry be maintained at a suitable temperature and that adequate ventilation be provided. In the foundries of the Manganese Bronze & Brass Company, heating is provided by fan-operated unit heaters, some of which are arranged to heat and circulate the air in the building, while others have controllable inlets from outside the building so that heated fresh air may be introduced. Steam is supplied from large vertical boilers and the heat input to the foundry is normally sufficient to ensure a temperature of 50 deg. inside when the outside temperature is 32 deg. F., with three air changes per hr.

Exhaust ventilation is provided for by 48-in. and 36-in. roof ventilators, all with power-driven fans, and with the latter in operation a maximum air change of six per hr. can be obtained. These fans are normally only required during tapping-out and casting. A recording wet- and dry-bulb thermometer is installed in the foundry so that records of temperature and humidity are available.

FIG. 12.—GENERAL VIEW OF THE INGOT FOUNDRY.

A diagram of the building showing the layout of the unit heaters, ventilators, etc., is shown in Fig. 15. The ingot foundry also incorporates a simple and effective ventilation system, which is also shown in Fig. 16. In this shop large exhaust hoods fitted over each tilter are coupled to exhaust fans outside the building, five tilters being connected to each fan. The hoods are arranged to slide on tracks enabling them to be drawn back when charging, the pipes telescoping to allow for this movement. In addition to these arrangements, natural ventilation is provided by 36-in. Robertsons natural draught ventilators, working in conjunction with suitable air inlet panels, at low level adjacent to the casting benches. The flow of air induced by this arrangement quickly removes the fumes produced during pouring.

(*To be continued.*)

Nodular Cast Irons, Their Production and Properties*

By H. Morrogh and J. W. Grant†

(*Continued from page* 57)

Mechanical Properties of Nodular Irons

Fatigue.—Fatigue tests were carried out on 0.875-in. diameter bars from nodular irons V.980, V.895 and W.3 (see Table III) and also on two other nodular irons, NOD.67 and W.7, single- and double-treated respectively, and on a flake-graphite acicular iron V.636. A Wöhler-type cantilever machine rotating a 0.331-in. diameter specimen (Fig. 32) at 3,000 r.p.m. was used, a test being terminated after 20 million reversals of stress if failure had not occurred. The chemical compositions of NOD.67, W.7 and V.636 are given in Table VI, and the fatigue results on the five nodular irons and the flake graphite acicular iron in Table VII. The fatigue curves obtained on a single- and a double-treated nodular iron, NOD.67 and W.3 respectively, are shown in Fig. 33.

TABLE VII.—*Fatigue Tests of the Irons Detailed in Table* VI.

Melt No.	Tensile, tons/sq. in.	Fatigue limit.	Endurance Ratio, (Tensile) (Fatigue)	Structure.
V.980 ..	25.4	15.0	0.59	Quasi-flake, ferrite and pearlite
V.895 ..	35.2	16.0	0.46	Nodular, ferrite and pearlite.
W.3 ..	38.2	18.5	0.48	Nodular, pearlite
NOD.67	24.1	12.0	0.50	Quasi-flake, ferrite and pearlite.
W.7 ..	30.5	17.5	0.57	Nodular.
V.636 ..	33.9	11.5	0.34	Flake, acicular.

Fatigue strengths of 12 and 15 tons per sq. in. were obtained for single-treated, and 16 to 18.5 tons per sq. in. for double-treated nodular iron giving endurance ratios of 0.46 to 0.59. These are high compared with values of 0.34 and 0.45 obtained on flake-graphite acicular- and pearlitic-irons of similar tensile strengths tested on the same machine. In Fig. 34 endurance ratios are plotted against tensile strength for the nodular irons and some flake-graphite cast irons. For each type of iron the highest endurance ratio is associated with the lowest tensile strength.

Notched and grooved fatigue tests were carried out on nodular iron NOD.67 and on flake-graphite iron V.636 for comparison. The fatigue specimens for these tests were of the same over-all dimensions, but instead of finishing with a large radius, 0.05-in. radius grooves or 45 deg. circumferential notches were machined with root diameters of 0.331 in., the same as the minimum diameter of the plain specimens with the large radius. Fig. 32 illustrates the plain, grooved and notched fatigue test pieces. The calculated stress at the root of the notch or groove was thus the same as the maximum stress in the plain specimen for a particular load hung from the free end. Notched and grooved tensile bars were also machined from each material and broken in direct tension. The fatigue and tensile results on the plain, grooved and notched bars are given in Table VIII, together with derived stress concentration factors, and the fatigue graphs are shown in Figs. 35 and 36 for materials NOD.67 and V.636 respectively.

Both the notch and the groove weaken the materials appreciably in fatigue, but this weakening is greatest in the nodular iron. In the notched specimens the fatigue limit drops from 12 to 7 tons per sq. in. on the nodular material and from 11.5 to 8.5 tons per sq. in. on the flake-graphite iron, giving dynamic stress-concentration factors of 1.72 and 1.35 respectively. The groove weakens both irons to a lesser extent than the notch, but again the weakening effect is greater on the nodular iron.

The notched and grooved tensiles, on the other hand, show a slight increase in strength on the nodular

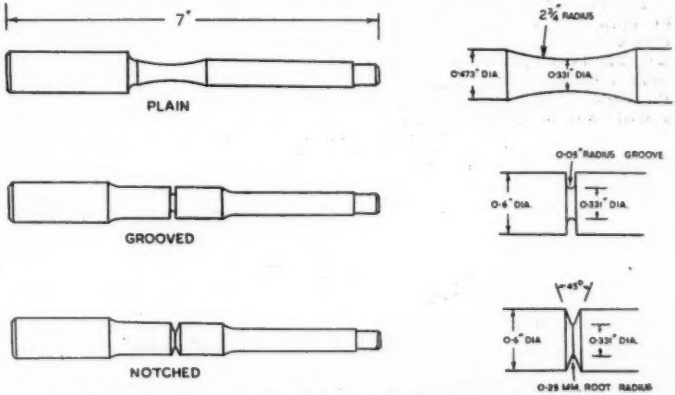


FIG. 32.—FORM AND DIMENSIONS OF FATIGUE TEST-PIECES.

*Presented at the London Conference of the Institute of British Foundrymen, June, 1948.

†The Authors are on the staff of the British Cast Iron Research Association.

Nodular Cast Irons

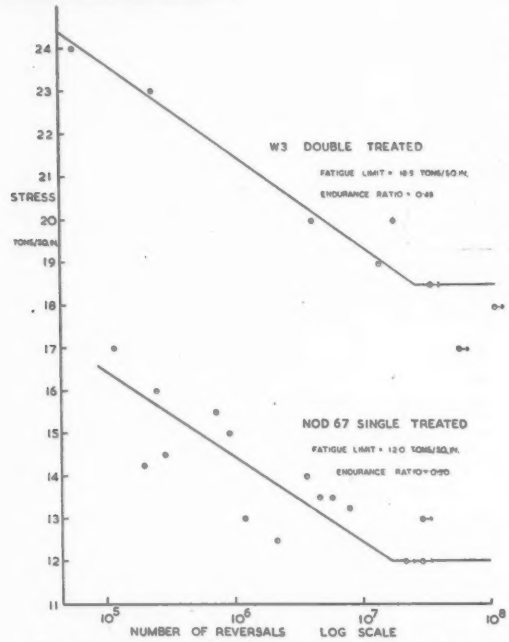


FIG. 33.—FATIGUE CURVES FOR NOD.67 AND W.3.

iron, but a considerable drop on the flake-graphite iron, particularly on the notched tensile test.

The data from these two materials are not sufficient to draw any definite conclusions, but they indicate that a nodular iron is not notch sensitive in a static test, but in a dynamic test it is more notch sensitive than a flake-graphite iron. A flake-graphite iron, on the other hand, is considerably notch sensitive in both a static and a dynamic test.

Shear.—No direct shear tests were carried out on the five nodular irons used for the other mechanical tests reported here, but evidence from tests on other nodular irons has shown that ultimate shear stresses are usually lower than the corresponding ultimate tensile stresses. Tests were carried out in double shear on specimens 0.875 in. diameter, but unless the specimens were a very accurate fit in the holders they tended to distort and crack in the holders, hence giving false results.

Table IX gives the results of direct shear and tensile tests on a number of nodular cast irons.

Electrical Resistivity

An average coefficient of electrical resistivity for a flake-graphite cast iron is 60 to 80 microhms per cub. cm., as compared, for instance, with a value of 14 for wrought iron and 17.6 for a mild steel. The difference is probably due to the presence of the graphite. Broadly speaking, in flake-graphite cast irons the electrical

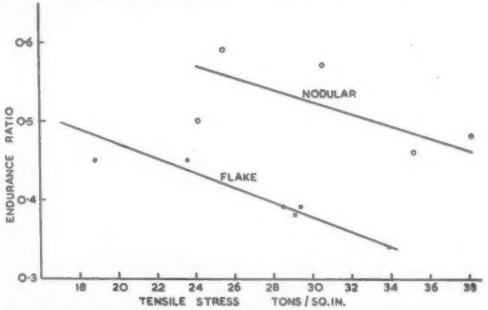


FIG. 34.—RELATION OF ENDURANCE RATIO TO TENSILE STRESS.

resistivity decreases with a decrease in graphitic carbon content. The restivity is apparently affected, too, by the form in which the graphite exists. The electrical resistivities obtained on the five nodular irons are given in Table V, and also in Table X, together with typical values for other cast irons, including an un-treated iron, W.161, of otherwise similar composition to those of the nodular irons, but which had not been cerium-treated. The structure of the un-treated iron consisted of large

TABLE VIII.—*Fatigue Strength of Plain, Grooved and Notched Bars.*

	NOD.67. Nodular.			V.636. Flake acicular.		
	Plain.	0.05 in. Groove.	45 deg. Notch.	Plain.	0·05 in. Groove.	45 deg. Notch.
Tensile, tons/sq. in.	24.1	26.4	25.9	33.9	30.6	26.4
Fatigue limit, tons/sq. in.	12.0	8.5	7.0	11.5	8.5	9.0
Endurance ratio, $\frac{\text{Fatigue}}{\text{Tensile (plain)}}$	0.50	0.35	0.29	0.34	0.27	0.25
Endurance ratio, $\frac{\text{Fatigue}}{\text{Tensile (notched)}}$	—	0.32	0.27	—	0.29	0.32
Static stress concentration factor, $\frac{\text{Tensile (plain)}}{\text{Tensile (notched)}}$	1.0	0.91	0.93	1.0	1.11	1.28
Dynamic stress concentration factor, $\frac{\text{Fatigue (plain)}}{\text{Fatigue (notched)}}$	1.0	1.41	1.72	1.0	1.28	1.35

TABLE IX.—*Tensile and Shear Test Results on Nodular Irons.*

No.	Cast test bar diameter, Inches.	Treatment.	Composition.						Ultimate shear stress, tons/sq. in.	Ultimate tensile stress, tons/sq. in.
			T.C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Ce. Per cent.		
1	1.2	Single	3.72	3.13	0.74	0.007	0.038	0.040	22.2	24.6
2	1.2	Double	3.90	3.10	0.51	0.007	0.024	0.031	26.7	33.0
3	1.2	Single	3.86	2.62	0.54	0.015	0.030	0.034	21.0	23.9
4	1.2	Single	3.86	2.62	2.28	0.015	0.030	0.038	24.5	28.3
5	1.2	Double	3.67	2.67	0.86	0.005	0.051	0.040	26.4	26.0
6	1.2	Double	3.50	3.03	0.88	0.008	0.055	0.061	27.4	33.8

graphite flakes in an almost entirely pearlitic matrix. The resistivities were determined on machined test bars, 0.5 in. diameter and 10 in. long, using a Kelvin double-bridge.

The electrical resistivities of the nodular irons were generally a little lower than the normal flake-graphite irons, but very much lower than the high carbon iron, W.161, of similar composition, but without the cerium addition. The cerium addition, therefore, appreciably lowers the resistivity, presumably due to the change from flake to nodular graphite.

Thermal Expansion

A temperature/expansion curve was determined on each nodular iron (Table III) from room temperature to 700 deg. C. A 2-in. long specimen was heated uniformly, the expansion read on a dial gauge, and

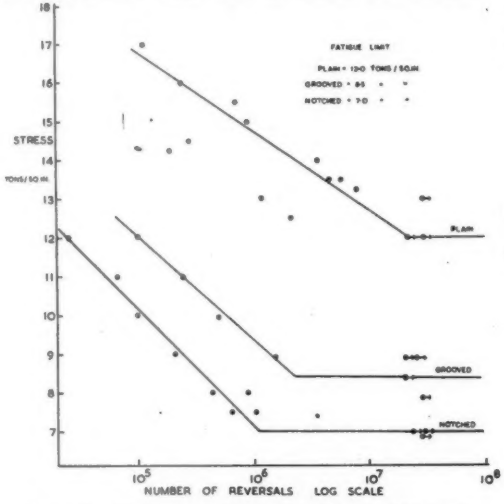


FIG. 35.—FATIGUE CURVES FOR PLAIN, GROOVED AND NOTCHED BARS FROM NOD.67.

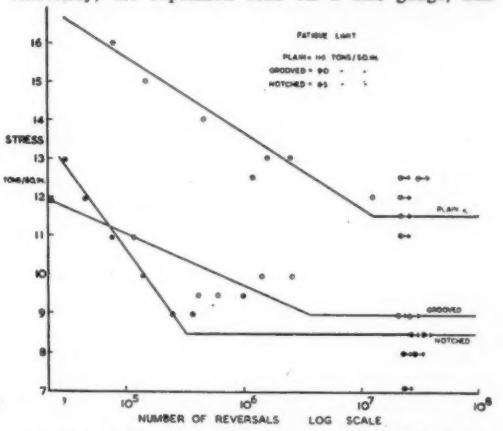


FIG. 36.—FATIGUE CURVES FOR PLAIN, GROOVED AND NOTCHED BARS FROM V.636.

TABLE X.—*Electrical Resistivity of a Number of Cast Irons.*

No.	Structure.	Chemical composition.									Electrical resistivity microhms per cu. cm
		T.C. Per cent.	C.C. Per cent.	G.C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Ce. Per cent.	Cu. Per cent.	
V.835 ..	Quasi-flake, ferrite and pearlite	3.74	—	—	2.65	0.53	0.006	0.024	0.053	—	62.6
V.980 ..	Quasi-flake, ferrite and pearlite	3.76	—	—	2.48	0.85	0.012	0.051	0.029	—	62.6
V.895 ..	Nodular, ferrite and pearlite ..	3.55	—	—	3.01	0.89	0.004	0.044	0.053	—	66.9
W.3 ..	Nodular, mainly pearlite ..	3.60	—	—	2.33	0.84	0.011	0.044	0.045	2.19	59.1
W.30 ..	Nodular, mainly pearlite ..	3.68	—	—	2.34	0.77	0.009	0.035	0.054	1.49	60.6
W.161 ..	Flake, mainly pearlite	3.81	—	—	2.29	0.51	0.032	0.032	—	—	101.7
V.93 ..	Flake, mainly pearlite	2.98	0.74	2.24	2.13	0.70	0.050	0.037	—	—	66.2
V.171 ..	Flake, mainly pearlite	3.16	0.52	2.64	2.46	0.54	0.007	0.036	—	—	75.3
Wrought iron	Ferrite	0.06	—	—	0.11	0.21	0.029	0.119	—	—	13.6
Mild steel	Ferrite	—	—	—	—	—	—	—	—	—	17.6

Nodular Cast Irons

the temperature measured on a chromel/alumel thermocouple. The variation of average coefficient of expansion with increasing temperature up to 700 deg. C. is given in Table XI.

All five irons showed an increase from 10 × 10-6 per deg. C. for the 20 to 100 deg. C. range to about 14 × 10-6 per deg. C. for the 20 to 700 deg. C. range. All five nodular irons were almost identical in respect of coefficient of expansion.

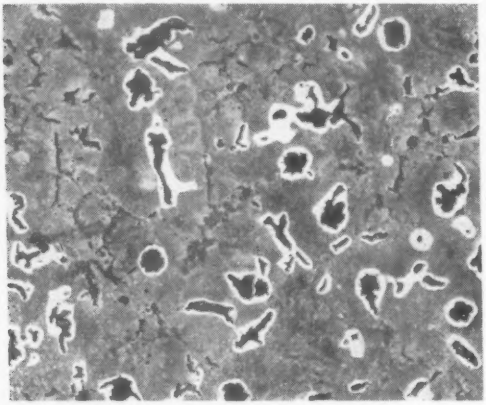


FIG. 37.—GENERAL STRUCTURE OF NODULISED HEMATITE RING-SPECIMEN. ETCHED IN PICRIC ACID. 60 ×.

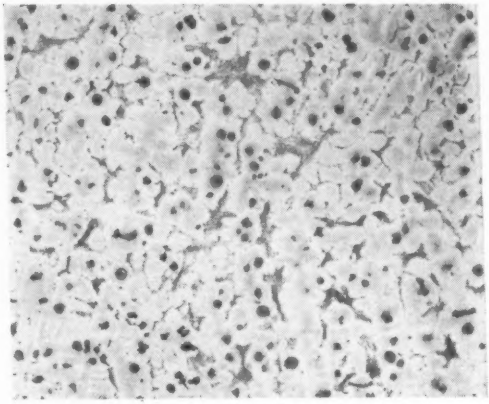


FIG. 38.—GENERAL STRUCTURE OF NODULAR NI-RESIST RING-SPECIMEN. ETCHED IN PICRIC ACID. 100 ×.

Ring Tests

Though no attempt has been made to make nodular iron piston-ring pots to meet any particular specification, a few tests have been made on rings machined from some experimental centrifugally-cast hematite and Ni-resist liners. The rings were approximately of piston ring dimensions, having a $\frac{\text{diameter}}{\text{radial thickness}}$ ratio of 26, and the tests were carried out to see the order of their tensile strength and E*n* value. The hematite liners were sand spun and double-treated, and the Ni-resist liners chill-spun and single-treated. The chemical analyses are given in Table XII, and the ring dimensions and mechanical properties in Table XIII. The microstructure of the hematite liner is illustrated in Fig. 37 and that of the Ni-resist liner in Fig. 38.

The tensile strength *f* and E*n* value were calculated from the expressions:—

$$f = \frac{Pd}{1200\ bt^2}$$

Where P = diametral load required to cause fracture and

$$En = 14.14 \left(\frac{d}{t} - 1\right)^3 \times \frac{T}{bl}$$

TABLE XI.—*Thermal Expansion of Nodular Cast Iron.*

No.	Coefficient of thermal expansion per deg. C. × 10-6.						
	20–100 deg. C.	20–200 deg. C.	20–300 deg. C.	20–400 deg. C.	20–500 deg. C.	20–600 deg. C.	20–700 deg. C.
V.835	10.5	11.3	11.8	12.3	12.6	12.8	13.4
V.980	10.3	11.4	12.1	12.6	13.0	13.2	13.7
V.895	10.6	11.3	12.0	12.5	12.8	13.2	13.8
W.3	10.5	11.4	12.0	12.6	13.1	13.5	14.1
W.30	10.3	11.4	12.1	12.6	13.0	13.3	13.9

TABLE XII.—*Chemical Composition of Irons used for Ring Tests.*

Material.	T.C. Per cent.	Si. Per cent.	Mn. Per cent.	S. Per cent.	P. Per cent.	Ce. Per cent.	Ni. Per cent.	Cr. Per cent.	Cu. Per cent.
Hematite, sand-spun, Nodular, No. 3	3.80	2.53	0.82	0.015	0.032	0.055	—	—	—
Ni-resist, chill-spun, Nodular, No. 13	3.01	2.86	0.85	0.012	0.029	0.060	13.55	1.88	5.67

TABLE XIII.—*Results of Ring Tests of Ni-resist and Nodular Irons.*

Material.	Diameter d Inches.	Width b Inches.	Radial thickness Inches.	Tensile Stress f Tons/sq. in.	Modulus of elasticity E_B × 10⁶ lb./sq. in.	Permanent set at stress of 14 tons/sq. in. Per cent.	Permanent set at stress of 21 tons/sq. in. Per cent.
Hematite No. 3	3.45	0.252	0.132	47.2	21.5	8.7	12.2
Ni-resist No. 13	4.82	0.253	0.186	Unbroken	20.8	16.6	36.6

Where T = tangential load required to close gap,
1 = free gap.

The Ni-resist ring extended until it came off the knife edges of the machine, but did not break.

Special and Alloyed Nodular Cast Irons

With one exception, the examples of nodular cast irons which have been given so far in this account have all had matrix structures of pearlite, or pearlite and ferrite. The process is, however, applicable to a wide range of alloyed cast irons, including those with austenitic, martensitic and acicular structures, and such irons always show a pronounced improvement in mechanical properties consequent upon the development of the nodular-graphite structure. Although, from the point of view of tonnage cast, such irons are of less importance than unalloyed materials, it is interesting to consider a few examples of the influence of the nodular-graphite structure upon their mechanical properties.

TABLE XV.—*Mechanical Properties of Untreated and Single-Treated Nomag.*

Bar size, in.	Transverse rup. stress, tons per sq. in.	Deflection, in.	Tensile strength, tons per sq. in.	Brinell hardness number.	Compression strength, tons per sq. in.
1.6	14.4	0.60	5.3	86.8	
1.2	16.5	0.80	5.9	90.7	
0.875	16.8	0.38	6.7	102	
0.6	18.8	0.32	7.3	102	59.6
Untreated: T.C., 3.28 per cent.; Si, 3.08 per cent.; Mn, 5.8 per cent. Si, 0.022 per cent.; P, 0.072 per cent.; Ni, 11.87 per cent.					
1.6	46.31	1.75	17.4	158	
1.2	46.7	2.00	16.7	156	
0.875	47.4	1.60	16.4	172	
0.6	41.7	0.65	15.8	174	86.3
Treated: T.C., 3.03 per cent.; Si, 3.18 per cent.; Mn, 5.9 per cent.: S, 0.018 per cent.; P, 0.053 per cent.; Ni, 12.93 per cent.; Ce, 0.023 per cent.					

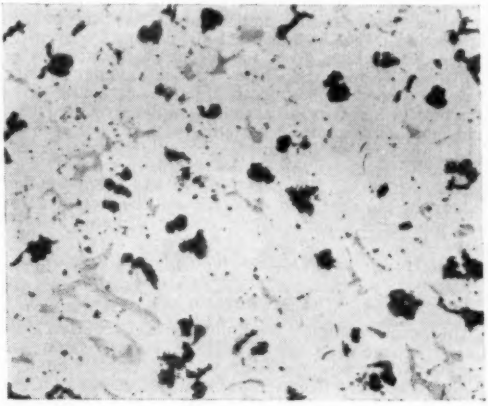


FIG. 39.—GENERAL STRUCTURE OF SAND-CAST NODULAR NI-RESIST. ETCHED IN PICRIC ACID. 100 ×.

1. *Austenitic Cast Irons*

When the nickel content of nodular cast iron exceeds about 10 per cent., it is not necessary for the iron to be hyper-eutectic according to the formula: per cent. C. in eutectic = 4.3 − ⅓ (Si per cent. + P per cent.). The treatment may, therefore, be applied, for instance, to the austenitic iron Ni-resist without any modification of composition other than control of the phosphorus and sulphur contents in accordance with the conditions already set out. In Table XIV the chemical analyses and mechanical properties of untreated and single-treatment Ni-resist are given for material cast in the form of 0.875 in. bars. The untreated material had a structure consisting of undercooled graphite in a matrix of austenite, together with

TABLE XIV.—*Mechanical Properties of Untreated and Single-Treatment Ni-resist.*

	T.C., per cent.	Si per cent.	Mn, per cent.	S, per cent.	P, per cent.	Cr, per cent.	Cu, per cent.	Ni, per cent.	Ce, per cent.
Untreated ..	2.76	2.68	0.45	0.027	0.024	1.74	6.74	13.24	—
Treated ..	—	—	—	0.007	—	—	—	—	0.045

	Transverse rup. stress, tons per sq. in.	Deflection, in.	Tensile strength, tons per sq. in.	Brinell hardness number.
Untreated ..	29.2	0.47	12.2	146
Treated ..	47.4	0.86	20.3	185

Nodular Cast Irons

a small amount of carbide. The structure of the treated bar is shown in Fig. 39 to consist of nodular graphite in a matrix of austenite with some carbide. Slightly more carbide was present in the treated than in the untreated material.

The high-manganese nickel-containing austenitic iron, Nomag, may also be treated to give nodular structures with a considerable improvement in mechanical properties. This is illustrated by the results given in Table XV, which gives the mechanical properties of un-treated Nomag and single-treatment nodular Nomag. The un-treated bars all had structures of coarse flake graphite in a matrix of austenite, and the treated bars had nodular graphite in austenite with a little carbide. The improvement in transverse rupture stress, deflection and tensile strength due to the treatment vary between 100 and 200 per cent. of the corresponding values for the untreated material, and the Brinell hardness number has increased by about 70 points in each case.

(*To be continued.*)

Correction

Under the heading "The Influence of Cerium in Cast Iron," on page 27 of the July 8 issue of the JOURNAL, we regret that it was recorded that the sulphur content might be reduced from 0.6 per cent. to 0.2 per cent. by the addition of cerium. The first figure should have read 0.06 per cent.

Die Neue Giesserei

We welcome the republication under its new name of "Die Neue Giesserei," the old-established German foundry technical paper—Die Giesserei. It is to appear monthly under the editorship of Dr. Hugo. The provisional price is 7.50 marks to cover the first quarter.

The first issue contains articles on high-duty cast irons, by Professor Piwowarsky; on foundry coke by J. H. Kuster; balanced output from German foundries by H. Bukart; the consolidation of moulding sand by K. Roesch; the rational organisation of the non-ferrous foundry industry by Günther Hücking; short supplies and good management by Dr. T. Geilenkirchen, and the importance of gate cutting by H. Reininger. Amongst abstracts there are many from British authors:—Hurst; Everest; Grant and Morrogh; N. L. Evans; Shotton; Rambush and Taylor; Ritchie; Harding; D. J. Taylor; and Barnes and Hicks. A good start has been made, probably under considerable difficulties, and we congratulate Dr. Hugo, the editor, on his initial effort.

THE ENGINEERS', BUYERS' AND REPRESENTATIVES' ASSOCIATION, 47, Victoria Street, London, S.W.1, have instituted a drive for increased membership. The Association was established only a year ago as an organisation catering for a specialised class of technicians earning more than £450 a year and possessing sensible qualifications.

Mechanisation in Foundries

Last Friday, as part of the Convention programme organised in conjunction with the Mechanical Handling Exhibition, a Paper on "Mechanisation in Foundries" was given at Olympia by Mr. J. Bain, A.M.I.Mech.E. The Author surveyed the various applications in the foundry of different types of mechanisation. In the course of his remarks he placed emphasis on the fact that the various types of handling equipment which together make up a mechanised foundry are all to be found in many other factories, but in detail the handling problems differ and require specialised knowledge. The foundry crane, for instance, he said, looks the same as any other crane, but it requires a smooth, slow-speed device on the hoisting and lowering motions so as to prevent damage to the moulds. Elevators, conveyors and chutes have to handle heavily-bonded sand, which, owing to its sticky nature, tends to build up on and choke the plant. The bearings on all equipment require special attention to prevent the entry of highly-abrasive dust, which would soon cause trouble. It was apparent, therefore, he continued, that equipment which would be installed in a works handling comparatively dry or free-running non-abrasive material would not prove satisfactory in a foundry. Owing to these conditions the wear-and-tear on foundry plant is great and a very high standard of maintenance is demanded if trouble-free running is to be achieved.

Sections of the Paper were devoted to stockyard and cupola-charging equipment; moulding-shop and core-shop conveying and handling; metal pouring and knock-out; sand preparation; fume extraction and electrical plant; and fettling shop layout and machinery. The illustrations were profuse and carefully chosen from well-established schemes.

Association of Bronze and Brassfounders

The April-June Bulletin of this Association carries as its main feature a contribution from Mr. G. L. Bailey, the director of the British Non-ferrous Metals Research Association. This sets out the type of research undertaken, the results achieved (which are of major importance to the non-ferrous founder), and future activities. The whole article is a well-reasoned answer to the question "What are the advantages to be gained from membership of B.N.F.M.R.A.?"

There is an account of a meeting of the technical committee at which crucible life, synthetic resin core binders, and the mechanical properties of castings were also discussed.

House Organ

Oil. The Journal of the M.O.R. Group of Companies, Vol. I, No. 2. Price 1s.

This issue well maintains the standard set initially, which is of importance, because, before the first appears, there is always a large accumulation of matter to choose from. It now carries some 42 pages, and is well illustrated. It is a combination of good general reading for the layman and paragraphs dealing with happenings within the organisation.

British Standards Institution

Endless V-belt Drives (*B.S. No.* 1440 : 1948)

The British Standards Institution has recently published B.S. 1440:1948, Endless V-belt Drives. This new standard deals with endless V-belts having an included angle of 40 deg. and consisting of rubber and textile materials; and with V-groove pulleys, used primarily for power transmission for industrial purposes. It does not cover automotive V-belt drives and variable speed drives employing pulleys with movable flanges. In one section it deals with belts of M, A, B, C, D, and E cross-sections, the nominal inside lengths of belt covered ranging from 15 to 358 in., dependent on the cross-section. It specifies nominal cross-sectional dimensions and pitch lengths, with the permissible variations and defines how these lengths shall be measured.

A further section deals with the standard dimensions of V-grooved pulleys and sets out recommendations in regard to standard pitch diameters, installation and take-up allowances. An appendix gives recommended practice for the power application of V-belts and includes power correction factors for different types of service, and arc of contact and horse-power ratings for the various V-belt sections in relation to the pitch diameter of smaller pulleys. This new British Standard is obtainable from the Sales Department, 24, Victoria Street, S.W.1, price 3s. post free.

Death of Mr. J. J. Kelly

We regret to record the passing of a real old-time foundryman, Mr. J. J. Kelly, a director of Kelly & Cleaver, of 237, Walworth Road, London. He was well into the seventies, and never learnt to read or write. When he was foreman with the Aston Construction Company, Limited, and Mr. Aston decided, in 1936, to close down the foundry, he and Mr. Charles Cleaver, who was the foundry cost clerk, decided to establish themselves in business, which prospered from the outset. Both partners were very keen on technology, and together they joined the Institute of British Foundrymen over 30 years ago. Despite his educational disabilities, Mr. Kelly was a really high-grade foundryman.

PROF. PORTEVIN has been promoted to a *Commandér* of the *Légion d'Honneur* and Mr. Waeles and Mr. Laissus have been created *Chevaliers* of that Order. All are prominent in the affairs of the *Association Technique de Fonderie.*

THE PROGRAMME for the Institute of Australian Foundrymen announces a Paper on September 15 from Mr. A. J. Murphy, M.Sc., a director of J. Stone & Company, Limited, on "Some Foundry Aspects of Cast Aluminium Bronzes."

MR. GUY HENON has been elected general secretary of the *Association Technique de Fonderie.* A donation of 1,000,000 francs has been received from the *Centre Technique de Industries de la Fonderie.*

New Catalogues

Air Compressors. Alfred Bullows & Sons, Limited, Long Street, Walsall, Staffs, have made good use of three-colour printing, with blue predominating, for embellishing an eight-page leaflet covering a line of single-stage compressors. The specifications are clearly set out and the illustrations neatly arranged. The last page is devoted to a line of spray-painting equipment, but it is not quite so pleasing to the eye as the rest of the pages.

Control Instruments. Tinsley (Industrial Instruments), Limited, Werndee Hall, South Norwood, London, S.E.25, have used a loose-leaf folder to present an illustrated technical description of the various instruments they handle. First there is a description of a pyrometer outfit for measuring and indicating the temperature of the metal in an electric steel melting furnace. It uses the Schofield and Grace type of quick-immersion thermocouple and a Tinsley amplifier to operate a large indicator on the furnace stage and also to record the results in an appropriate office.

Cleaning Castings. From Spencer & Halstead, Limited, Bridge Works, Ossett, Yorkshire, comes the first post-war folder received from the foundry equipment industry and, unlike many of the pre-war vintage, it does present its pages the right way up. It has been carried out in jet black with the trade mark picked out in orange, and it describes and illustrates a new type of airless rotary-barrel blast cleaning machine. Of neat design, the machine shown takes 5-cwt. loads, which are dealt with in 10 to 15 min. The slow speed (2 r.p.m.) minimises breakages. A dust exhaust is incorporated and, including this feature, 17 h.p. is used for the operation. A built-in separator rejects sand and scale, whilst returning only clean abrasive to the impeller. The last page shows castings "before" and "after" cleaning, and for the uninitiated should be so labelled.

Publication Received

Bibliography of Permanent Mould Process. Compiled by Harold E. Bourassa and published by Wheeler Consultancy, Incorporated, Poli Building, 196, Worthington Street, Springfield, Mass, U.S.A.

This 24-page mimiographed publication covers the contributions to the literature of both ancient and modern gravity die-casting processes. The number of references quoted is 279. In examining this list, one receives the idea that the American expression "permanent mould" is superior to the British "gravity die casting," especially when dealing with the moulds prepared by craftsmen during the bronze age. As further editions of this extremely useful publication are envisaged; it is suggested *Moderne Foundrie* be placed where it no doubt rightly belongs—with *Fonderie Moderne.* American business houses are usually so generous that it is thought that if readers write to Springfield they may receive a copy gratis.

Pig-iron and Steel Production in Great Britain

The following particulars of pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for June, 1948, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in May, with the number of furnaces in blast at the end of the month; Table II, production of steel ingots and castings in May, and Table III, deliveries of non-alloy and alloy finished steel. Table IV summarises steel-industry activities during the six months ended May, 1948.

TABLE I.—*Weekly Average Production of Pig-iron and Blast-furnace Ferro-alloys, May, 1948.* (*Thousands of Tons.*)

District.	Furnaces in blast, 29.5.48	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts, Northants, Essex	26	—	15.7	22.4	1.1	—	39.2
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Ches.	6	—	7.1	—	—	1.4	8.5
Yorkshire (incl. Sheffield, excl. N.E. Coast)							
Lincolnshire	14	—	24.9	—	—	—	24.9
North-East Coast	25	8.0	38.7	0.4	—	1.2	48.3
Scotland	9	0.7	11.6	3.0	—	—	15.3
Staffs., Shrops., Worcs., and Warwick	8	—	7.9	1.3	—	—	9.2
S. Wales and Monmouthshire	8	4.0	19.5	—	—	—	23.5
North-West Coast	6	14.5	—	0.1	—	0.2	14.8
Total	102	27.2	125.4	27.2	1.1	2.8	183.7
April, 1948	101	26.0	124.2	26.0	2.1	3.1	181.4
May, 1947	88	17.5	97.9	22.3	1.6	2.6	141.9

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1947 (53 weeks).	1948 (1st 5 months).	1947. May.	1948. April.	1948. May.
Non-alloy Steel:—					
Heavy rails and sleepers	7.6	8.8	7.5	8.5	7.8
Heavy and medium plates	31.6	37.0	31.7	38.3	37.6
Other heavy products	31.8	35.2	34.5	33.8	34.8
Light rolled products (excl. wire rods and alloy-steel bars)	49.7	56.4	49.6	59.4	53.1
Ferro-concrete bars	3.2	3.7	3.1	3.8	3.5
Cold-rolled strip	4.6	4.7	4.6	5.2	4.1
Bright steel bars	4.8	5.9	5.0	6.2	5.8
Sheets, coated and uncoated	24.3	26.4	25.5	28.1	25.4
Tin, terne and black-plate	12.1	13.7	12.0	14.7	12.5
Tubes and pipes	13.5	14.8	13.8	15.7	14.5
Wire	10.8	12.2	11.3	12.8	12.1
Tyres, wheels and axles	3.5	3.7	3.2	4.0	3.4
Forgings	5.0	5.6	4.5	5.9	5.3
Castings	3.0	3.4	3.1	3.4	3.3
Total	205.5	231.5	209.4	239.8	223.2
Alloy Steel:—*					
Plates	—	—	—	—	—
Tubes and pipes	0.3	0.5	0.3	0.5	0.3
Bars, sheets, strip and wire	3.7	4.4	3.8	4.4	4.6
Drop forgings	1.3	1.7	1.1	1.9	1.7
Other forgings	0.5	0.5	0.4	0.5	0.5
Castings	0.6	0.6	0.7	0.7	0.5
Total	6.4	7.7	6.3	8.0	7.6
Total U.K. production†	211.9	239.2	215.7	247.8	230.8
Less Intra-industry conversion	19.2‡	25.9	17.2	26.4	27.7
Total U.K. deliveries	192.7	213.3	198.5	221.4	203.1
Add deliveries of imported finished steel	2.2	2.4	—	3.6	1.9
Total deliveries of finished steel	194.9	215.7	198.5	225.0	205.0

* Excludes high-speed steel.
† Includes finished steel made from imported ingots and semi-finished steel. ‡ Revised.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in May, 1948.* (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex	—	—	(Basic) 10.1	1.3	0.2	11.1	0.5	11.6
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Ches.	1.6	22.0	—	1.0	0.3	24.1	0.8	24.9
Yorkshire (excl. N.E. Coast and Sheffield)								
Lincolnshire	—	28.5	—	—	0.1	28.5	0.1	28.6
North-East Coast	2.0	57.9	—	0.7	0.5	59.7	1.4	61.1
Scotland	5.1	36.3	—	2.0	0.8	42.4	1.8	44.2
Staffs., Shrops., Worcs. and Warwick	—	13.9	—	0.6	0.7	13.9	1.3	15.2
S. Wales and Monmouthshire	10.2	43.8	(Basic) 5.6	0.9	0.1	60.3	0.3	60.6
Sheffield (incl. small tonnage in Manchester)	8.0	23.7	—	7.2	0.6	37.9	1.6	39.5
North-West Coast	0.4	2.0	(Acid) 4.5	—	0.1	6.9	0.1	7.0
Total	27.3	228.1	20.2	13.7	3.4	284.8	7.9	292.7
April, 1948	28.4	228.7	18.7	14.6	3.5	285.5	8.4	293.9
May, 1947	22.1	192.6	15.3	10.8	3.1	237.0	6.9	243.9

(Continued at foot of facing page.)

Death of Mr. Harry Brearley

Mr. Harry Brearley, the metallurgist, who discovered stainless steel, died on July 14 at Torquay. His name will go down in the history of steelmaking along with such names as Bessemer, Mushet, Hadfield, Hatfield, and other pioneers. He was the son of a steel melter, and commenced work at the age of 11 in the crucible department at the Sheffield works of Thos. Firth & Sons, Limited, where he met James Taylor, then chief chemist, to whose teaching he attributed much of his success. In 1901, Brearley joined Kayser, Ellison & Company, Limited, and during this period was concerned in the analysis of type metals for Stephenson Blake & Company, Limited, typefounders, which laid the foundation for the present firm of Amalgams Company, Limited.

In 1902, he collaborated with Fred Ibbotson, lecturer in the Department of Metallurgy at the University of Sheffield, in a book called "Analysis of Steelworks Materials," which became a standard work. Joining the Riga works of Thos. Firth & Sons in 1904, he subsequently became works manager. In 1907 he returned to Sheffield and took charge of combined researches of Thos. Firth & Sons and John Brown & Company, Limited, until 1915, during which period he discovered the corrosion-resisting properties of high-chromium steels, leading to the "invention" of stainless steel. In 1915, Brearley became works manager and later technical director of Brown Bayley's Steel Works, Limited. He wrote extensively on metallurgical subjects.

He was elected a member of the Iron and Steel Institute in 1905, and subsequently became a member of the Council and vice-president, and Bessemer gold medallist in 1920. Among his other offices were:—Director of Firth-Brearley Stainless Steel Syndicate, Limited, and chairman of Amalgams Company, Limited, and Welding Rods, Limited. His published autobiography was called "Knotted String." He retired in 1925, touring Australia and South Africa in 1929-30. For many years since his retirement he had lived at Torquay. He received the freedom of the city of Sheffield in 1939.

Indian Imports of Metal Products

A report recommending import duties ranging up to 35 per cent. *ad valorem* on certain non-ferrous metal products imported into India from Great Britain has been made by the Indian Tariff Board and accepted by the Indian Government. The report recommends duties of 24 per cent. on copper sheets, pipes and tubes of British manufacture and of 36 per cent. on the same products of non-British manufacture; of 35 per cent. on copper rods (other than electrolytic) of British manufacture and 45 per cent. on similar rods of non-British manufacture; and of 20 per cent. on electrolytic copper rods of British manufacture, 30 per cent. if of non-British manufacture. Other products affected include brass ingots (10 per cent.) and zinc sheets and lead sheets (20 per cent.).

Changes of Name

The following companies have recently changed their names, the new titles being given in parentheses:—

INTERNATIONAL CORRODELESS, LIMITED, metal treaters, etc., of Enfield (Roval, Limited).

SAUNDERS VALVE COMPANY (CWMBRAN), LIMITED, Cwmbran (Saunders Valve Company, Limited).

SUCCESSORS TO SMITH'S FORGINGS COMPANY, LIMITED, Aston, Birmingham (Smith's Forgings Company, Limited).

TITAN TRACKWORK COMPANY, LIMITED, tramway and railway track manufacturers, etc., of Sheffield (Titanic Steel Company, Limited).

EIGHTY TONS of pig-iron, valued at £1,046, were imported into Eire in May, compared with 38 tons (£1,343) in May, 1947. Imports of iron bars and rods totalled 27 tons, valued at £1,046, against 15 tons (£619), while 783 tons of steel bars and rods, valued at £27,670, against 633 tons (£17,159), and 1,520 tons of iron and steel squares and flats, valued at £32,872, against 207 tons (£6,890), were imported during the month.

PIG-IRON AND STEEL PRODUCTION IN GREAT BRITAIN (*Continued from previous page.*)

TABLE IV.—*General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (inc. alloy).			Steel stocks.†
						Imports.	Output of ingots and castings.	Deliveries of finished steel.	
1938	228	89	—	130	118	16	200	—	—
1946	234	115	169	149	147	8	244	192	1,068
1947 (53 weeks)	209	130	165	147	145	8	240	195	797
1947—December*	224	149	188	165	145	6	243	196	797
1948—January	239	154	196	168	169	4	281	208	777
February	246	164	198	176	174	5	289	221	749
March*	243	169	192	179	175	7	291	219	780
April	247	169	200	181	178	7	294	225	793‡
May	239	173	202	184	175	4	293	205	844

* Five weeks. † Stocks at the end of the years and months shown. ‡ Revised.

News in Brief

THE UNIVERSITY OF LEEDS has received a grant of £40,000 to cover part of the cost of founding a Chair of Wool Textile Engineering Research.

THE LONDON BRANCH of British Insulated Callender's Cables, Limited, is now at 21, Bloomsbury Street, W.C.1. (Telephone: Museum 1600.)

WORK HAS COMMENCED on a new foundry for Joshua Hindle & Sons, Limited, at Great Wilson Street, Leeds. It is intended ultimately to build an entirely new factory at this site.

SOME 120 MEMBERS of the Bradford Engineering Society visited the works of Dean, Smith & Grace, Limited, ironfounders, lathe manufacturers, etc., of Keighley, on July 3.

IN ORDER TO increase output, the Derby works of Crompton Parkinson, Limited, is being extended by the addition of a new bay for manufacturing high-quality electric cables.

THE MANGANESE BRONZE & BRASS COMPANY, LIMITED, Ipswich, announces that its works will be closed from to-morrow (Friday) until Tuesday, August 3, for the annual summer holidays.

THE BRUSH ELECTRICAL ENGINEERING COMPANY, LIMITED, has received an order from Umfolozi Co-operative Sugar Planters, Limited, South Africa, for a 2,500-kw. turbo-alternator set.

COWANS, SHELDON & COMPANY, LIMITED, Carlisle, has received an order from the London Midland Region of the British Railways for a turntable of 70-ft. dia. with vacuum turning gear.

FAZALBHOY, LIMITED, 16, New Queen's Road, Bombay, 4, is asking for catalogues, price-lists and details of availability of various items of canteen, refrigeration and air-conditioning equipment.

THE COST TO THE British Iron & Steel Corporation (Ore), Limited, of manganese ore for the manufacture of blast-furnace ferro-manganese has been increased to 2s. 2d. per unit as from July 1 last.

W. B. REYNOLDS COMPANY, Room 335, M. & M. Building, Houston, Texas, is seeking agencies on commission of U.K. manufacturers of electrical and house-ware lines to cover the States of Texas, Louisiana, Mississippi, Oklahoma and Arkansas.

THREE GENERATIONS of moulders are employed in the foundry of John Harper & Company, Limited, Willenhall, Staffs. Mr. William Holmes, who is 67, has 47 years' service, while his son has worked there for 21 years and his grandson for four years.

IN THE SIX MONTHS to the end of June, Scottish shipbuilders launched 57 vessels of 186,250 tons gross—35 vessels of 139,775 tons gross on the Clyde and 22 vessels of 46,475 tons gross from East Coast shipyards. The East Coast output is higher than that of the corresponding months of last year, but the Clyde production shows a decrease of 17,000 tons.

"Board Action Recognises the Importance of Castings"

The role of the foundry industry in war potential is stressed in an editorial by Mr. Frank G. Steinebach in our American contemporary "The Foundry." He writes:—

"Planning for the mobilisation of industry in event of a possible war emergency has been making considerable progress under the direction of several Government agencies. The National Security Resources Board has been preparing an overall plan covering the co-ordination of military, industrial and civilian mobilisation. The Munitions Board of the Military Establishment has been setting up industry advisory committees, conducting plant surveys and developing general broad procedures relating to military procurement, production and distribution. The various branches of the military establishment are working with industry to develop materials and industrial production methods which will meet the ever-changing needs of the services.

"The Munitions Board now is engaged in a survey of some 11,000 industrial plants to determine individual plant capacities, types of products which each company is best fitted to produce, and other pertinent information needed by the Army, Navy, and Air Force. From this study, which will be kept current by a perpetual inventory, the Munitions Board will be in position to allocate production capacity of specific industrial plants on the basis of requests from the Armed Services.

Guide for Foundrymen

"To help industrial managers think of their own plant's role in an emergency, the Munitions Board recently has issued an interesting booklet entitled 'Military Procurement—A Guide for Joint Industry-Military Procurement Planning.' The guide provides an extensive check list of questions, which need not be answered and returned, but which will give top management an opportunity to determine just where their own organisation can fit into the plans for military procurement. Every foundryman should obtain a copy of this guide and give it careful study. Consideration of the problem now may improve the chance of survival in total war.

"Recent action of the Munitions Board and the Iron and Steel Industry Advisory Committee in recommending the establishment of a separate Foundry Industry Advisory Committee embracing producers of grey-iron, malleable-iron, steel and non-ferrous castings should be a source of gratification to the foundry industry and to the National Castings Council, which developed the idea. Surely this is an important step in planning the mobilisation of this industry. Through this committee, when it is activated, the Armed Services and other Government agencies will learn more about the essentiality of castings in our national defence, and the foundry industry will be in position to render maximum service to this nation in time of emergency."

Industrial Electricity Load

Winter Economies

The Government has accepted recommendations by the Electricity Sub-committee of the National Joint Advisory Council, said Mr. Isaacs, the Minister of Labour, in the House of Commons, when he announced that steps must be taken next winter to reduce the load on power stations during peak periods. The main recommendation is that during December, January, and February, when the demand is highest, the load should be reduced on a national basis so that it does not exceed 80 per cent. of the maximum peak industrial load in the winter of 1946-47. In October, November, and March the problem varies in the different regions, and permits a regional approach. Accordingly, the regional boards should consider the circumstances of their own regions, and, in collaboration with the British Electricity Authority, take appropriate steps. It is also intended that next winter commercial consumers—including shops, offices, warehouses, hotels, cinemas, etc.—shall be brought within the scope of the arrangements made by the regional boards for industry.

A national committee on which the consumers will be represented is being formed by the Ministry of Fuel and Power to consider questions of national application.

So far, it has proved impracticable to organise arrangements to secure a reduction by domestic consumers, but a committee under Sir Andrew Clow has investigated means of controlling their demand, and its report will be published shortly.

New Generating Plant

Sir Robert Gould, Chief Industrial Commissioner at the Ministry of Labour, who is chairman of the Electricity Sub-committee of the National Joint Advisory Council, said recently that, as a result of the war, the provision of new generating plant was seriously in arrear. Every effort was being made to supply new plant, but during the peak periods in winter demand was bound to exceed supply. Unless all consumers economised electricity cuts were inevitable, with the most harmful effects on production and economic recovery.

Referring to the plans for the coming winter, Sir Robert said that statutory powers for dealing with cases of unreasonable failure to apply schemes would again be granted. Last winter those powers were not used, and he was confident that there would again be the same public spirit and readiness to co-operate.

Mr. J. D. Peattie, the representative on the Sub-committee of the British Electricity Authority, said that, at the present rate of commissioning, it was expected that generating plant would catch up with demand in 1952.

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED, announced on July 2 that the U.S. Government anti-trust suit against the company had been terminated by agreement.

Record Steel Output in June

Success of Scrap Drive

Steel production in June reached the record annual rate of 15,444,000 tons. This compares with a rate of 15,220,000 tons in May and 13,206,000 tons in June, 1947.

For the six months ended June 30, production totalled 7,564,000 tons, an annual rate of 15,128,000 tons, which means that, even allowing for the usual fall during the holiday period, production is so far running above the rate required to meet the revised target for 1948 of 14½ million tons.

The continued success of the home scrap drive has meant that over the past three months there has been no further fall in either scrap or pig-iron stocks despite the high rate of steel-ingot production. Pig-iron production was at an annual rate of 9,417,000 tons, compared with 9,552,000 tons in May and 7,502,000 tons a year ago.

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
	Tons.	Tons.	Tons.	Tons.
1948—January ..	167,800	8,726,000	280,600	14,589,000
February ..	176,300	9,169,000	289,400	15,049,000
March ..	178,900	9,303,000	290,700	15,117,000
April	181,400	9,433,000	293,900	15,283,000
May	183,700	9,552,000	292,700	15,220,000
June	182,000	9,464,000	297,000	15,444,000
1947—January ..	150,100	7,806,000	239,800	12,470,000
February ..	126,200	6,560,000	206,300	10,726,000
March ..	123,100	6,400,000	196,000	10,190,000
April	139,200	7,238,000	236,400	12,294,000
May	141,900	7,378,000	243,900	12,684,000
June	144,300	7,502,000	254,000	13,206,000

New Patents

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed, and all subsequent proceedings will be taken.

595,197 SHELL DEVELOPMENT COMPANY. Recovery of molybdenum, tungsten and uranium.

595,214 BRIMELOW, E. I., and DUDZINSKI, N. Aluminium alloys.

595,250 WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY. Systems for producing gaseous atmospheres for use, for example, in the heat-treatment of metals.

AN ORDER has been received by the Hunslet Engine Company, Limited, Leeds, from John Summers & Company, Limited, steelmakers, of Shotton, Chester, for three 204-b.h.p. six-wheel straight Diesel locomotives for heavy-steel works shunting at the Hawarden Works.

Contracts Open

The dates given are the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Bangkok, October 15—Two non-propelling Diesel-electric dipper dredgers, and five small non-propelling oil-driven bucket dredgers, for the Irrigation Department of the Siamese Minister of Agriculture. The Irrigation Department, Ministry of Agriculture, Bangkok, Siam. (Fee 100 Ticals.)

Belgian Congo—Enamel basins (30, 32, 34 cms.), for the Société Anonyme D'Entreprises Commerciales Au Congo. S.E.D.E.C., 150, Rue Royale, Brussels.

Cheadle, July 28—Construction of approx. 1,467 yds. of 6-in., 8,541 yds. of 4-in., and 9,057 yds. of 3-in. dia. spun-iron pipes, etc., for the Rural District Council. Mr. J. W. Burton, engineer and surveyor, Council Offices, Leek Road, Cheadle. (Fee £3 3s., returnable.)

Dunmow, July 29—Provision and laying of approx. 25 miles of spun-iron pipes, for the Rural District Council. Edward Sandeman, Kennard & Partners, consulting engineers, 1, Victoria Street, Westminster, London, S.W.1. (Fee £3 3s.. returnable.)

Ruislip-Northwood, August 18—Construction of approx. 3 miles of 9-in. to 24-in. dia. spun-iron and concrete pipe sewers, etc., for the Urban District Council. Howard Humphreys & Sons, 17, Victoria Street, Westminster, London, S.W.1. (Fee £10 10s., returnable.)

Stoke-on-Trent, August 31—Construction of approx. 350 yds. of 36-in., and 50 yds. of 30-in. dia. cast-iron pipe sewer. and 1,560 yds. of 36-in. dia., 1,010 yds. of 30-in. and 70 yds. of 18-in. dia. concrete pipe sewer, for the Corporation. The City Engineer and Surveyor, Town Hall, Stoke-on-Trent. (Fee £5, returnable.)

York, August 30—Contract No. 22—Supply of cast-iron penstocks. Contract No. 23—Supply and erection of rotary sewage distributors, for the City Council. Mr. C. J. Minter, city engineer, Guildhall, York. (Fee £1, returnable.)

Revised List of Import Restrictions

The Board of Trade has announced that a new consolidated list of import restrictions (Control of Imports into the United Kingdom, Notice to Importers No. 292) is now available. This incorporates all amendments made to the former list, which was issued in March, 1947, insofar as they are still operative.

Copies of the list can be obtained upon application to the Import Licensing Department. Board of Trade, 189, Regent Street, London, W.1.

THE BATTLESHIP Resolution, of 29,150 tons displacement, is to be broken up by Metal Industries (Salvage), Limited, at Faslane. The vessel is now nearly 32 years old.

Gazette

THE PARTNERSHIP BETWEEN Frederic Gordon Taylor and John Samuel Williams, carrying on business as engineers, etc., at Cilfrew Works, Neath, Glamorgan, under the style of Taylor & Williams, has been dissolved. Debts will be received and paid by F. G. Taylor, who continues.

THE COMPANIES REGISTRATION OFFICE gives notice that the undermentioned companies have been struck off the register and are thereby dissolved:—Agricultural Implement Makers (Berkshire), Limited; Aluminium Aero & Marine Tanks, Limited; Coleman Rotary Compressor Company, Limited; Langford Gauge Company, Limited; Rycroft Engineering Company, Limited; Ameib Tin Mining Company, Limited; Edgbaston Engineering Company, Limited; Mollington Engineering Company, Limited; Peters Engines & Aircraft, Limited; Wire-Wound Pipes, Limited.

Engineers Press for Wages Inquiry

A request to the Minister of Labour to set up a public court of inquiry, under the Industrial Courts Act, to investigate the rejection by the employers of their claims for wage increases was decided upon at a meeting in York on July 14 of the executives of the 37 unions affiliated to the Confederation of Shipbuilding and Engineering Unions which adopted the recommendation of the Group Council of the Confederation which met the day before.

C. A. PARSONS & COMPANY, LIMITED, engineers, etc., was fined £100 with 10s. costs at Newcastle-upon-Tyne for a contravention of the 1937 Factories Act, when a painter employed by a firm of contractors working on extensions to C. A. Parsons & Company's works was struck by an overhead crane and received leg injuries.

ORDINARY STOCKHOLDERS in J. Brockhouse & Company, Limited, on the register on June 30 are being given the right to apply for one new £1 share at 64s. for every £3 of stock held. This will involve a total issue of 300,766 shares. The additional funds are needed to provide working capital for the new Clydebank factory, to finance increased trade and to reduce bank overdrafts.

S. RUSSELL & SONS, LIMITED, of Leicester, iron and non-ferrous founders, etc., has just raised new capital largely to finance foundry mechanisation and greater output. An old-established family business now made public, the company has a total issued capital of £300,000, of which £180,000 is in 5 per cent. cumulative preference £1 shares and the balance in £1 ordinary shares. Standard Industrial Trust recently offered 121,351 of the preference shares at 1s. premium. The ordinary issue will continue to be held very largely within the family.

Personal

MR. R. B. DEELEY has been elected a director of Lightalloys, Limited.

MR. J. M. F. WHYTE has been elected to the board of Associated Clay Industries, Limited.

MR. E. C. HOPKINS has resigned from the board of G. Hopkins & Sons, Limited, brewers' and bottlers' engineers, of Highbury, London, N.7.

MR. H. F. PADBURY has been appointed chairman of the Ebbw Vale Metallurgical Society and has been elected an honorary member of the Council of the Iron and Steel Institute.

MR. W. A. MCPHAIL, a director of Richard Crittall & Company, Limited, heating and ventilating engineers, of Brentford, Middx, has been appointed joint managing director of the company.

MR. K. N. SWASH, Leeds branch manager of Brookhirst Switchgear, Limited, Chester, has been appointed chief engineer of the company. He will be succeeded at Leeds by MR. H. R. RENFREE.

MR. HARRY W. JEANS, personnel manager of William Doxford & Sons, Limited, shipbuilders, of Sunderland, has received a presentation to mark his retirement after 53 years' service with the company.

MR. R. E. WARDLAW has been appointed sales engineer for Scotland, Northern Ireland and Eire of Turbine Gears, Limited, Stockport, a subsidiary company of Henry Simon (Engineering Works), Limited.

MR. J. W. ANGUS, production manager of Pyrotenax, Limited, electric-cable makers, of Hebburn-on-Tyne, for nine years, has been appointed general manager and chief engineer of Hipprum Wires, Limited, Halifax, Yorks.

MR. T. GRAEME HALDANE has been elected president of the Institution of Electrical Engineers for the year 1948-49. MR. A. J. GILL and COL. B. H. LEESON have been elected vice-presidents and MR. E. LEETE hon. treasurer.

MR. J. BENNIE, acting on medical advice, has relinquished his position as chairman and managing director of Bennie Lifts, Limited, of Vauxhall, London, S.E.11. He has disposed of the whole of his shareholding in the company.

MR. A. P. MILLAR, of Lamberton & Company, Limited, steelworks plant manufacturers, engineers, iron and brass founders, of Coatbridge, who is retiring at the end of August, will be available for consultation on behalf of the company in Lancashire and surrounding districts.

MR. R. J. HUNT has been appointed deputy chairman of Ransomes, Sims & Jefferies, Limited, engineers and ironfounders, of Ipswich. MR. G. B. W. SCHOLEFIELD has been appointed an executive director of the company in charge of export sales. MR. L. C. HORSLEY has tendered his resignation as an executive director, but remains on the board of the company.

MR. ASHLEY S. WARD, for many years chairman of Thos. Smith & Sons (Rodley), Limited, crane and excavator makers, of Leeds, retired from the board on June 30. MR. FREDK. H. SMITH, as from the same date, relinquished his position as joint managing director, but remains on the board in an advisory capacity. MR. F. R. STAGG has now been appointed chairman and managing director of the company, with MR. W. H. SHARP as joint managing director, and MR. T. N. F. SMITH as assistant managing director. Thos. Smith & Sons (Rodley), Limited, is closely associated with Thos. W. Ward, Limited, Sheffield.

MR. L. P. LORD (Austin Motor Company, Limited), MR. F. C. MANNOX (Murex Welding Processes, Limited), MR. J. A. ORIEL (Shell Refining & Marketing Company, Limited), VICE-ADMIRAL SIR CHARLES SIMEON (Vickers-Armstrongs, Limited), and MR. J. H. N. THOMPSON (John Thompson, Limited) were elected as members of Council at the annual meeting of the British Welding Research Association. COMM. SIR ROBERT MICKLEM (Vickers-Armstrongs, Limited) and MR. V. E. GREENWOOD (formerly of Murex Welding Processes, Limited), who have retired from the Council, received a hearty vote of thanks in recognition of their services to the Council and the Association.

MR. J. C. G. COSSEY retired from the boards of the A.B.C. Coupler & Engineering Company, Limited, Wota, Limited, and Meboe, Limited, at the end of June after 28 years' service, the last 15 as a director. Mr. Cossey commenced as a premium apprentice in 1900 at the Stratford works of the Great Eastern Railway, later becoming a draughtsman. Prior to and during the first world war he gained experience in the shops of the Grand Trunk Pacific Railway, Winnipeg, afterwards becoming shop superintendent to the Canadian National Railways, Winnipeg. He joined A.B.C. Coupler & Engineering Company, Limited, as engineer and secretary in 1920, becoming a director and chief engineer in 1933. MR. JAMES B. CURRY, director, has been appointed managing director of A.B.C. Coupler & Engineering Company, Limited, Wota, Limited, and Meboe, Limited. MR. A. W. STRUDWICKE, works manager, who has been with the company for 33 years, and MR. G. H. SMITH, chief designer, who has served for 30 years, have been appointed joint general managers of the A.B.C. Coupler & Engineering Company.

BY THE END of this month, shipbuilding output on the Wear will have amounted to 22 ships of 142,000 gross tons, nearly 30,000 tons less than in the first seven months of 1947.

IN A STATEMENT to shareholders recently, Mr. D. M. Semple, chairman of the Mirrlees Watson Company, Limited, engineers, ironfounders, etc., of Glasgow, said that orders booked for the condensing and pump departments would not be completed until 1951. These included four sets of condensers, etc., of 30,000-kw. capacity for the new Wigan power station and three 20,000-kw. sets of similar equipment for the Electricity Supply Commission of South Africa.

Company News

(Figures for previous year in brackets.)

Massey-Harris—Interim dividend of 10%, tax free.

W. H. Dorman & Company—Dividend of 37½% (same).

John Bolding & Sons—Interim dividend of 5% (same).

Electric Construction Company—Dividend of 12½% (same).

Beeston Boiler Company—Final dividend of 27½%, making 37½% (same).

Bradley & Company—Dividend of 70%. The company was made public last March.

Steel Corporation of Bengal—No dividend on the ordinary shares for 1947 (8 annas).

Platers & Stampers—Interim dividend of 12½%. The company was made public last January.

Duple Motor Bodies—Final dividend of 12½% (10.625%), making 20% (14.166% for 8½ months).

Charles Carr—Net profit to June 30, £37,354, less tax (£31,215); to tax, £24,212 (£18,937); final dividend of 65% (75%), making 125% (same); forward, £16,356 (£13,610).

Renold & Coventry Chain Company—Net profit available to the parent company for the 40 weeks ended April 4, £148,841 (£153,941 previous year); to profits tax deduction for previous year, £11,100; income tax, previously reserved, now freed, £80,774; to investment reserve, £4,809 (nil); re-equipment reserve, £23,000 (same placed to capital reserve, now renamed re-equipment reserve); general reserve, £95,000 (£40,000); preference dividend for three-quarters of year, £6,920 (£9,227); ordinary dividends aggregating 12% (15% for year); forward, £47,109 (£32,990).

Briton Ferry Steel Company—Trading profit for the year to April 3, £253,263 (£259,844); investment income, £17,388 (£19,171); to taxation, £126,000 (£100,000); depreciation, £73,018 (£61,852); reserve for modernisation and contingencies, nil (£35,000); net profit, £46,948 (£59,303); receivable in respect of deferred repairs charged in the previous year, £14,123 (nil); final dividends from subsidiary companies, £8,235 (nil); balance of investments reserve and other provisions not required, £20,022 (nil); to preference dividend, £12,833 (same); ordinary dividend of 15% (same); general reserve, £30,000 (£20,000); forward, £80,006 (£57,449).

J. Stone & Company—Trading profit for 1947, £523,803 (£545,742, including £220,000 excess profits tax recovered, plus interest on investments), income from investments, £49,502; capital dividend from subsidiary, £16,267; profit on sale of investments, £13,351; profit on matured sinking fund policies, £15,564; superannuation, £34,287; depreciation, £110,397 (£298,914); income and profits tax, £250,000; net profit, £218,858 (£242,828); income tax no longer required and war damage expenditure recovered, £77,198; preference dividend, £21,450 (same); ordinary dividend of 25% (same); reserve, £50,400; contingency reserve, £77,198; forward, £410,896 (£346,443).

W. & T. Avery—Trading profit for the year ended March 31, £458,599 (£389,026); revenue from properties, £665 (£136); income from subsidiaries and other investments, £191,121 (£150,568); surplus on realisation of property and Government securities, £6,800 (nil); depreciation and obsolescence, £94,311 (£70,053); capital reserve, £50,000 (nil); overseas taxation, £35,973 (£22,222); U.K. taxation, £275,155 (£208,952); patents written off, nil (£1,000); net profit, £162,694 (£202,067); tax provision no longer required, £75,000 (nil); reconversion and development reserve, £100,000 (£50,000); research reserve, nil (£50,000); pensions, £10,000 (nil); preference dividend, £8,141 (same); ordinary interim of 5% (same), £23,490; final dividend of 15% (10%, and bonus of 5%), £70,470 (same); forward, £96,854 (£71,261).

Recent Wills

GARRETT, D. J., iron manufacturer, of Biggar, Lanarkshire	£19,964
FLEMING, W. J., a partner in Fleming Bros., structural engineers, of Glasgow	£60,008
BARTON, ERNEST, late of P. M. Walker & Company, Limited, ventilating engineers, etc., of Halifax	£20,150
HUGHES, MRS. EMMA, of Finchley, London, N., and the Church Bell Foundry, Whitechapel Road, London, E.1	£7,380
MACGREGOR, ALEXANDER, a partner in the firm of P. & R. Fleming & Company, iron stockholders, etc., of Glasgow	£42,006
COWARD, W. J., founder and head of Walter J. Coward & Company, Limited, mechanical engineers, of Bath	£5,505
RILEY, J. T., of Poynton, Ches, a representative of Baxendale & Company, Limited, lead manufacturers, etc., of Manchester	£2,413
FOURACRE, E. J., of Ealing, London, W., a director and general sales manager of the Westinghouse Brake & Signal Company, Limited	£10,052
GRATWICK, E. K., chairman and technical director of Smethwick Drop Forgings, Limited, and a director of Beans Industries, Limited, and S.D.F. (Kidderminster), Limited	£43,988
TURNBULL, S. M., of Greenock, managing director of the Greenock Dockyard Company, Limited, a director of the Iron Trades Employers' Insurance Association, Limited, and the Steel Company of Scotland, Limited	£43,589

New Trade Marks

The following applications to register trade marks appear in the "Trade Marks Journal":—

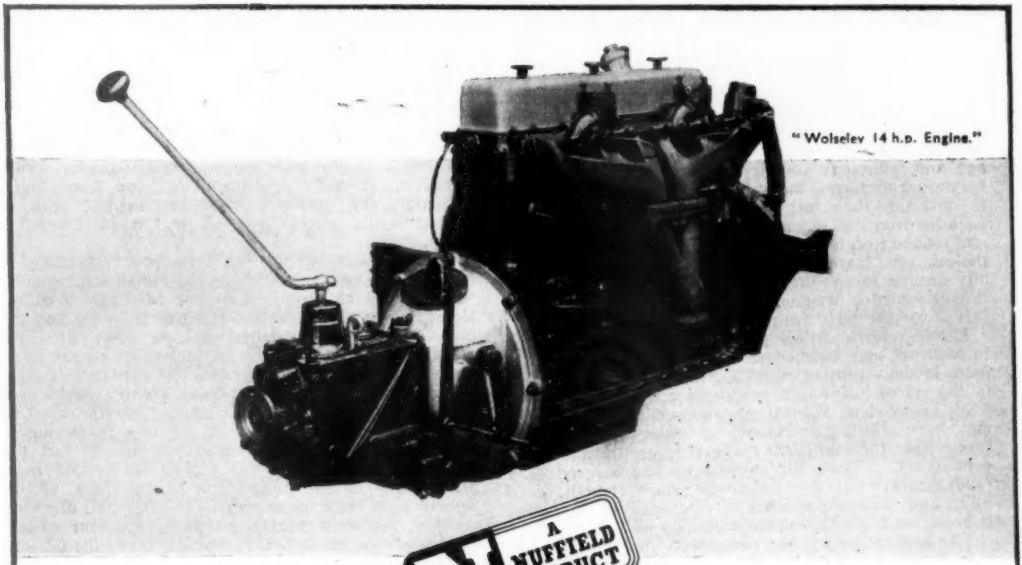
"DOLPHIN" AND DEVICE—Marine engines. T. H. T. ENGINEERING, LIMITED, 27, Market Place, Reading, Berks.

"HYDRACUT"—Cutting machines. STRACHAN & HENSHAW, LIMITED, Central Engineering Works, Lewins Mead, Bristol.

"HILLTOP" (DEVICE)—Lawn mowers. HILL TOP FOUNDRY COMPANY, LIMITED, Anchor Works, Smith Road, Wednesbury.

"AMAZON" (DEVICE)—Washing, laundering machines, etc. JAMES ARMSTRONG & COMPANY, LIMITED, 29, St. James's Place, London, S.W.1.

"PERKINS"—Diesel engines (other than for land vehicles). F. PERKINS, LIMITED, River Plate House, 12-13, South Place, London, E.C.2.



Using

STANTON-DALE

REFINED PIG IRON

USED AND RECOMMENDED
FOR ALL HIGH-DUTY
ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Raw Material Markets

Iron and Steel

During the past three or four months the production of pig-iron has varied between very narrow limits, but the position is now somewhat easier. An additional blast furnace was started in the Midlands a few weeks ago and, although foundrymen are still pressing for maximum tonnages, they are experiencing less difficulty in obtaining their full allocations. The make of both foundry iron and hematite has been slightly increased and refined iron is now more readily obtainable. Nevertheless, stocks are at a very low level and if there is any decline in consumption during the holiday period, it will afford a welcome opportunity to build up reserves for the busy autumn period.

Latest returns indicate a further shrinkage in the imports of semi-finished steel and the slight improvement in the supply of re-rolling material is entirely due to the efforts of home producers to bridge the gap. Mills engaged on light sheets and sections, small bars, etc., have still an abundance of orders in hand, and rarely have they sufficient material to ensure maximum production. Thus, the steelmakers are assured of a ready market for any defectives which they have to offer, and a certain amount of electrically melted steel is being used, chiefly for the execution of export orders.

The hesitant note in the commodity markets does not extend to the steel trade, where values are still fortified by a demand substantially in excess of the supply. At some of the works it is suggested that larger allocations could be handled, but this is a matter which is capable of speedy adjustment. For every ton of finished steel there is still an urgent demand and the authorities are keeping a firm control of direct exports to ensure maximum deliveries to the exporting industries at home. Shipbuilders still insist that their constructional programmes, and even repair work, are impeded by restricted deliveries of steel plates, angles, etc., while maintenance work on the railways is limited by the rationing of material.

Non-ferrous Metals

Quiet conditions are ruling in non-ferrous metals and, with the approach of the August holiday, there is not likely to be any improvement for the time being. That is not to say that there is no business passing at all, for buying continues, even though it is at a somewhat reduced rate. Scrap metal prices, although no recovery has taken place, are rather steadier, and for the moment the fall seems to have been halted. Probably holders of secondary metal are inclined to sit back and await events during this quiet holiday spell, especially as there appears to be every chance of the zinc quotation in the United States being raised in the very near future. This would presumably mean an upward adjustment on this side and the price of brass semis would be raised; no doubt brass scrap would follow. In any case, the Ministry of Supply would increase its selling limits for zinc-base alloy. S.A.A. brass cases, and 60/40 fuse scrap, the only items remaining in the official list. Actually there is a wages decision pending in the United States which may well affect the prices of the non-ferrous metals just as the increase granted to the steelworkers will operate to advance the cost of their product. All quotations are very firm across the Atlantic and quite recently we have seen an advance in the price of a number of brass and copper semis. In the United Kingdom, it will be remembered, we have had a reduction, this action being taken in line with the Government's request to industry to get quotations down.

There is nothing further to report regarding the Metal Exchange, a question in the House regarding the reopening being answered by the Minister of Supply along non-committal lines. It seems fairly evident that the Government is determined to make the same mistake in metals as it did in rubber, by deferring decontrol until an onerous surplus is in existence. Among consumers, who can see clearly enough which way events are tending, there is increasing nervousness over the absence of any means of securing protection by hedging, matters being made worse by the fact that inflation is rampant in the United States and metal prices still on the up-grade. In the face of this development bulk purchasing is helpless and our Government can only meekly accede to whatever price is demanded—or go without. And doubtless the Government has been obliged to commit itself many months ahead, which is something no buyer under a system of private enterprise would dream of doing at a time like the present.

Non-ferrous Metal Prices

Discrepancy between World and U.K. Quotation

Speaking at the third annual meeting of the British Non-ferrous Metals Federation, Mr. W. H. Clarke, who was re-elected president for 1948-49, said that one of the regular subjects of discussion at monthly meetings held with officials of the Ministry of Supply had been the relation between the prices at which non-ferrous metals were sold to them by the Ministry and the world price at which their foreign competitors could buy.

"We have not ceased to emphasise the disadvantage at which this places British industry, and in this I include not only ourselves, but also our customers whose products, incorporating non-ferrous metals, account for more than half of this country's export programme. Unfortunately, this is one of the subjects upon which we have received sympathy, but, so far, without action. We shall, however, continue to press this point, in the hope that the British price may be brought rapidly into relation with the world price," stated Mr. Clarke.

He added that the meetings had also provided an opportunity to discuss the level of metal consumption. The Federation viewed with some anxiety the continued shortage of high-grade zinc and was constantly pressing the Ministry of Supply on the point.